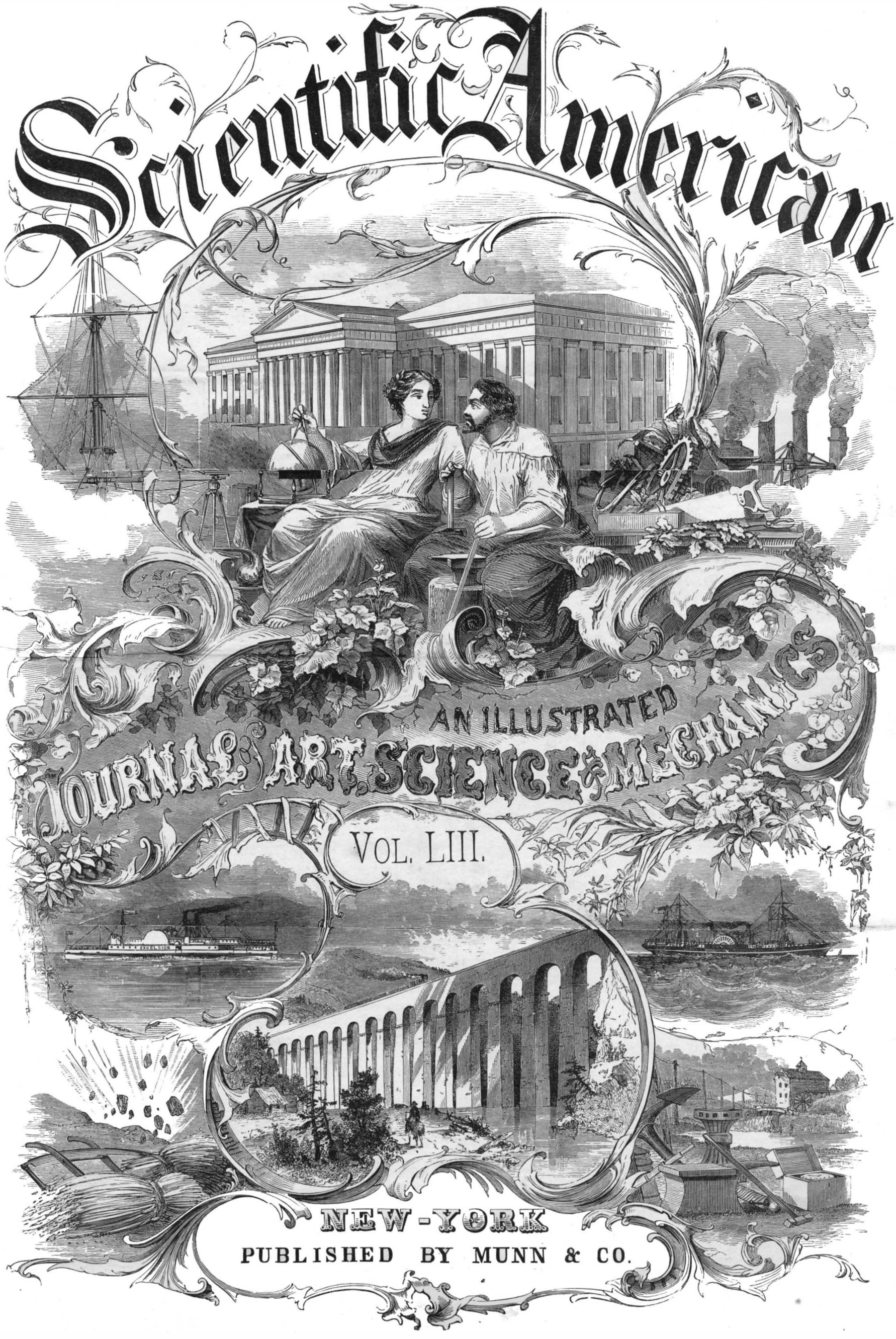
# Scientific American



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VOL. LIII.

NEW-YORK

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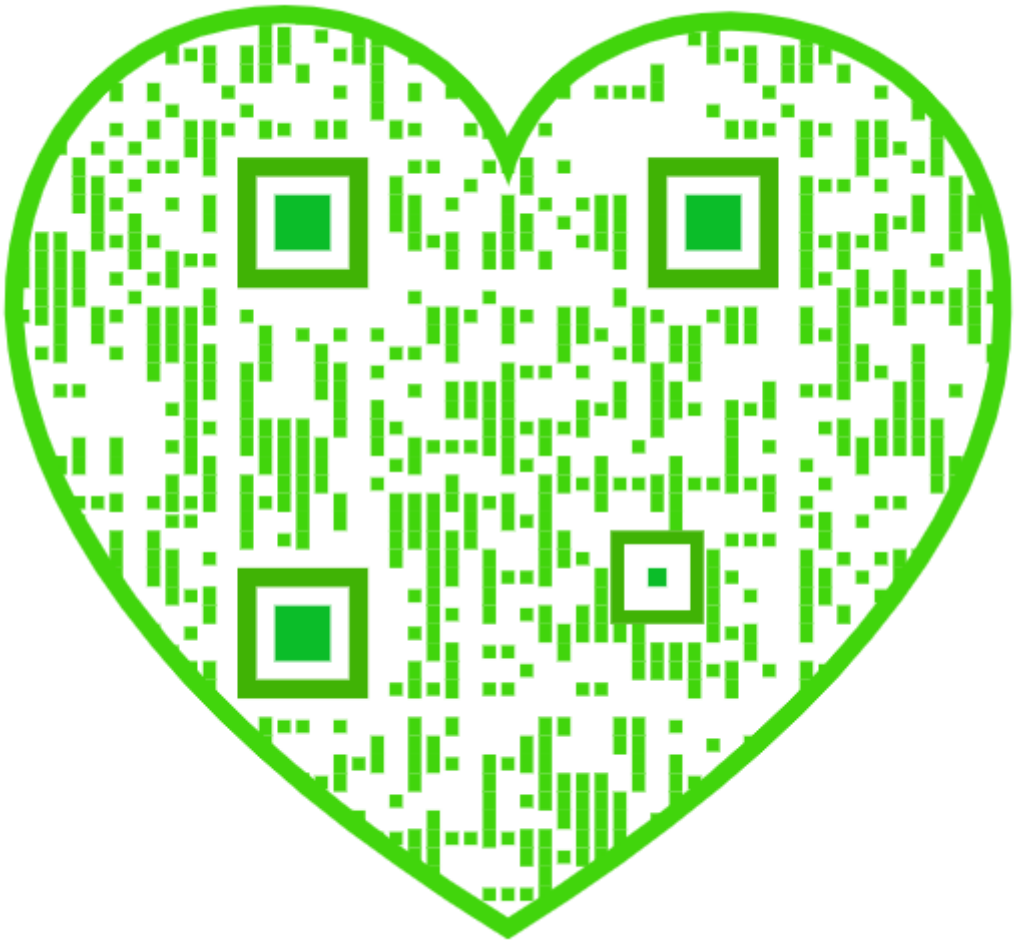

SCIENTIFIC AMERICAN

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## THE GREAT FRENCH GUN.

De Bange's new gun, which we are about to give a short description of, is of steel, and of 13-inch caliber. It weighs 37½ tons, and is 36¾ feet in length. Its external diameter is 3·4 feet at the breech, and its internal diameter 10 inches at the powder chamber. The trunnions are, as usual, of a diameter equal to the caliber. From this it will be seen that the gun is of quite respectable dimensions. Of the mode of closing the breech we have nothing to say, seeing that it is in all respects conformable to the type adopted for campaign guns (Fig. 1).

The projectile varies in weight from 922 to 1,320 pounds, according to its internal organization. It is capable of holding as many as 88 pounds of compressed power. Its length is 3·74 calibers, that is, 4·16 feet. Its ogive is greatly elongated, and, by very reason of this form, always falls upon its point, even at falling angles of nearly 60 degrees.

The charge used varies from 396 to 440 pounds, according to the nature of the powder. As regards the ballistic properties of the piece, it is allowable to call them remarkable. The initial velocity is 2,130 feet. The maximum range is from 10 to 11 miles, say the distance from Paris to Montgeron, or from Paris to Versailles. As well known, the accuracy of any gun is, generally speaking, a function of its caliber, and increases with the weight per unit of the projectile's section. Now, the De Bange 9-inchgun is so accurate that none of its projectiles could miss a vessel under sail, and the one under consideration must be still more accurate, inasmuch as its elongated projectile is of relatively great weight per unit of section.

The tube and hoops were made at Saint Chamond, the finishing was performed at Paris, in the shops of the Coil establishment, and the work in general required a year for its performance.

Upon coming from the forge, the tube had an internal diameter of but about 12 inches. In order to bring it to the desired caliber, it had to be submitted to a drilling that took twenty days and twenty-one nights of uninterrupted work. This was done by means of a new machine of Col. De Bange's invention, and the principle of which is kept a secret. All that can be said is that, during the process of drilling, the piece remains immovable and the tool advances as it revolves.

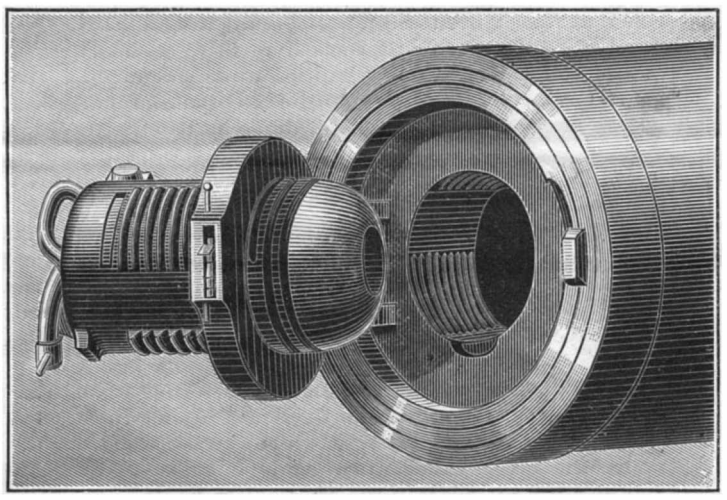

**Fig. 1.—DETAILS OF THE BREECH PLUG.**

The apparatus is automatic in its operation. The workman in charge has but one thing to do, and that is to ascertain at every pass whether the drill is in a bad or good state.

Every one knows that the tube of any cannon is obliged to resist bursting stresses that occur at one and the same time in the direction of the axis and in a direction at right angles thereto; and also that, in order to increase the tube's power of resistance in the last-named direction, recourse is had to hoops. Now, working thus transversely, the hoop furnishes no increase of strength in a longitudinal direction. As regards pieces of small caliber, this inconvenience is not a very grave one, seeing that by properly hammering the tube it is given a strength that suffices to withstand the pressure that tends to blow out the breech. Pieces of great caliber are placed under very different conditions, since, being necessarily of great thickness, the tubes can be but imperfectly hammered. For this reason, such tubes are wanting in resistance in a longitudinal direction; and, in order not to compromise economy, high pressures, which are the only ones that permit of giving heavy projectiles a proper initial velocity —that is to say, one greater than 1,600 feet— have had to be dispensed with.

The English have endeavored to remedy this trouble by the use of a jacket designed to compress the tube longitudinally; but this process has given results of but middling value, seeing that, practically, it is quite difficult to give a jacket of several yards a length that is *exact* to one one-hundredth and fiftieth of an inch. The longitudinal compression thus obtained is, therefore, illusory, whence it follows that, up to the present, the problem had never been solved. Now, however, we have a rational solution of it in the system of biconical hooping invented by Col. De Bange, which renders the tube and hoops absolutely interdependent in a transverse and longitudinal direction. To this end, the exterior of the chamber and the hoop that covers it present a succession of slightly truncato-conical forms, so arranged as to secure an intimate connection of them. The interdependence thus obtained is such that a transverse bursting of the chamber would necessarily tend to bring about a breakage of the hoops designed to strengthen it. Consequently, each of the hoops taken isolatedly has a biconical form, which obliges it to work, at the same time that the chamber

(*Continued on page* 6.)

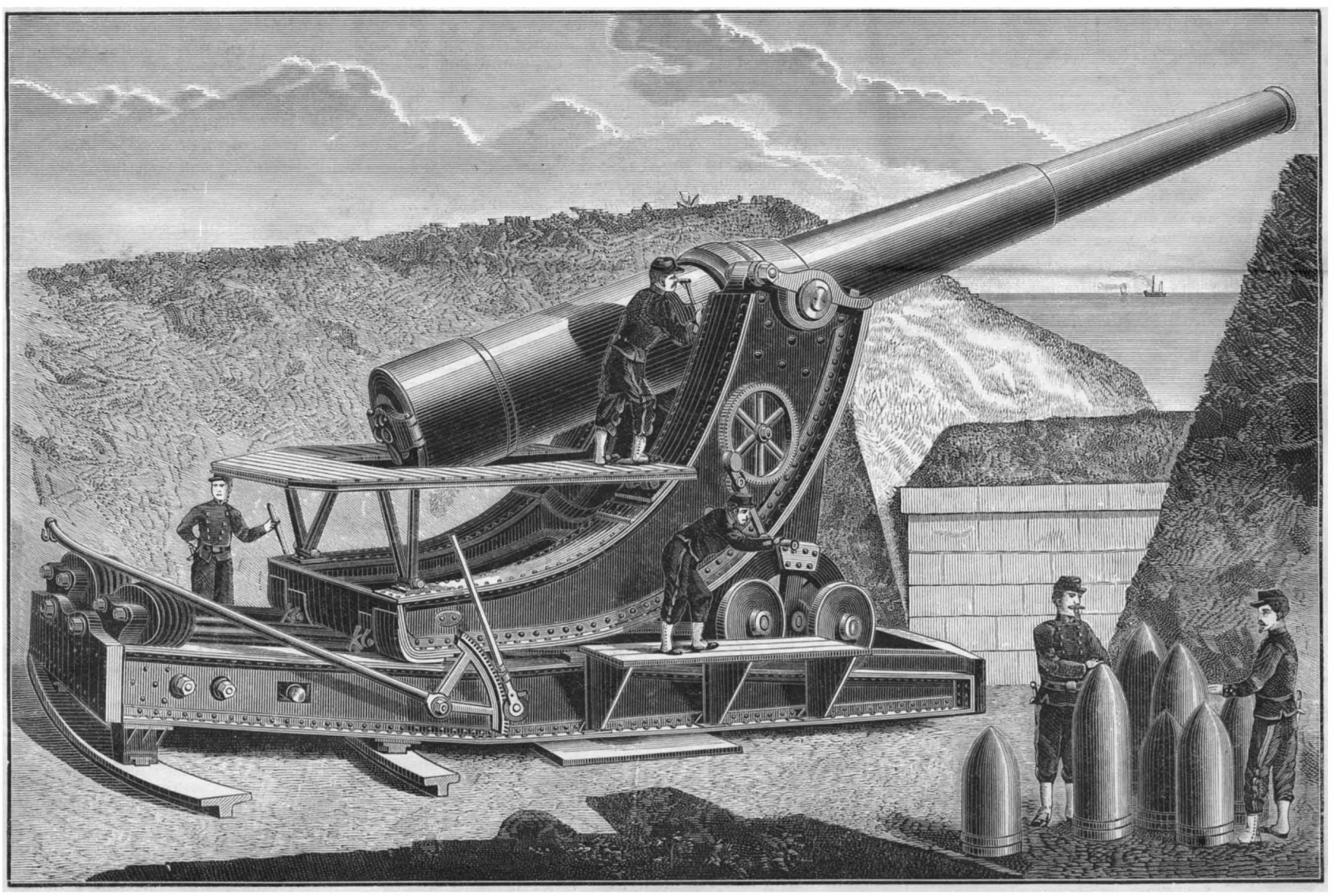

**Fig. 2.—THE GREAT FRENCH BANGE GUN—THIRTY-SIX FEET LONG, TEN MILES RANGE.**

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NEW YORK, SATURDAY, JULY 4, 1885.


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## AN ELECTRIC GUN.

Since the perfection of the breech-loading gun the aim of the mechanician has been to insure rapidity of fire, and magazines of various sizes and forms have been devised with a view of obtaining it. Experience in the field, however, has shown that these have a serious if not fatal defect. The cartridges, pressing, as they do, the one upon the primer of the other, are likely to explode prematurely, this rendering the device especially impracticable as a military arm. A writer on this subject says:

"A French army cartridge, which is about the average weight of military cartridges in use, weighs more than $1\frac{2}{5}$ ounces. The weight of a column of five such cartridges would be 7 ounces, four-fifths of which weight would, in a tubular magazine, rest upon the point of the bullet of the last cartridge, and which bullet comes directly in contact with the primer of the cartridge in advance of it. All ordnance officers and ammunition manufacturers realize the difficulty experienced in preparing fulminate of mercury—used for primers—that will, in practical use, always have a uniform degree of sensitiveness. It can be made so sensitive that the slightest scratch will ignite it, and many fulminate mixers have lost their lives by a moment's inattention or relaxation of caution while compounding it. While it is generally possible to produce fulminate of nearly equal quality, still different batches do vary; and whether it be from difference in the quality or from the different position or placement of the fulminate in the primer as regards the cartridge anvil, or otherwise, still it is certainly true that cartridges are to be found in use that will explode with one-half the concussion ordinarily required. It is a fact that cartridges have exploded by dropping a few inches from the machine in which they are loaded into the receptacle below."

In order to prevent the cartridges from resting upon one another, a system has been devised of placing them side by side in a metallic case, which can be attached under the breech, and when emptied replaced by another, and so on. But the mechanism is intricate, and the parts awkward to handle.

Several attempts have been made to use electricity for firing the cartridges, and thus do away with fulminate of mercury altogether.

About two years ago Colonel Fosbery, Royal Engineers, exhibited to the Royal United Service Institution an electric gun which he had brought with him from Liege. The cartridges were of the ordinary kind, but contained no fulminate of mercury. Col. Fosbery carried in his pocket a small primary battery of about the size of a two ounce vial, which was connected with the gun by a fine wire. This fired the cartridges as fast as they could be placed in the breech. For obvious reasons this could be of little use outside of a laboratory or lecture room.

Several months ago an electric gun was sent by an arms company to Captain S. A. Day, Fifth Artillery, at Fort Hamilton, for trial in the field. Captain Day, an expert in small arms, has tested this gun under all conditions and found it admirably contrived to answer the purpose, not only of a sporting gun, but also of a military arm. The mechanism is simple, the parts few, and the electrical firing contact sure. The principle is applicable to any arm. A primary battery, of cylindrical form, about 8 inches long by 1 in width, is set in the stock of the gun and connected with the primer of the cartridge; contact being made and broken by pressing on and releasing a trigger of the usual form. When this system is used, there is no need of tumbler, hammer, mainspring, or any of the ordinary safety levers used in firing percussion.

There is an electric igniter or primer inserted in an ordinary metallic base shell, and this primer can be tested before loading the shell, whereas with percussion primers, to test is to explode. The change from the percussion fire to the electric is so easy that any intelligent person can make it.

The electric primers for the shells are easily made too, and not easily destroyed by repeated firing. Captain Day says that the power of igniting charges of long proportions at any desired point along the central line, instead of at the base, as with percussion primers, or even at the wad as in the needle gun, gives the facility to burn the entire charge and under better conditions of using the expansive force. The exact point of ignition for best results should vary with dimensions and form of charge, but the power to determine at will the point at which ignition shall take place, and vary it, is given by this method. With the uniform precision of an electric point, an exactitude of performance and an economy of producing given results are secured not heretofore possible with any percussion fire.

In the recent and final trial of this electric gun, the cartridges were loaded in the field in order to show how many shots could be fired from a single shell, or rather how many could be fired without renewing the primer. In testing this, Captain Day and the writer fired alternately and repeatedly; the latter firing as many as ten rounds from one shell before it became necessary to renew the igniter. The battery is said to be good for more than fourteen thousand rounds before becoming exhausted and requiring recharging and renewal of elements. At an absolute trial in the gun works, where men fired notch by notch for weeks, we have Captain Day's authority for saying that within a few hundred rounds of 15,000 were fired from the same gun and with the same battery.

Probably the most convenient form of gun that this electro firing apparatus can be attached to is that type which has a tubular magazine, because, where no percussion is used, this seems by long odds to be the easiest handled, the weight being equally distributed, and because only the simplest mechanism is required to throw out the empty shell and send home the loaded one.

As a military arm the electric gun has great advantages. No magazine of cartridges primed with fulminate of mercury can withstand the ordeal of the manual of arms without imminent danger of premature explosion, and, as is well known, percussion cartridges rapidly deteriorate and become uncertain of fire when kept long in the field.

## SHALL WATER PIPES AND GAS PIPES BE CONNECTED WITH LIGHTNING RODS?

Every man who builds a house becomes interested in the subject of lightning rods, even if the subject of electricity had failed hitherto to attract him. In placing lightning rods upon a building, the question immediately arises, "Shall the water pipes and the gas pipes be connected with the exterior lightning rod?"

Theoretically, there is no doubt that this connection should be made. Great care, however, should be taken that the connections should be large enough not to be melted by a discharge of lightning, and that there should not be any break of metallic continuity caused by paint, varnish, or cement.

In the fifth annual report of the Water Commissioners of the city of Fitchburg, Mass., this paragraph occurs:

"During a violent thunder storm on the sixth day of June, two houses were struck by lightning, one on Burnap Street and one on Milk Street. The electric fluid in both cases followed the service pipes from the buildings to the 4 and 6 inch wrought iron cement lined main pipes, and when it reached these mains its path of ruin was fearful. In some cases a length of pipe would be split from end to end, others would be perforated with holes, which in almost every case indicate that the fluid passed from the outside to the inside of the pipe. Nearly every joint on the two thousand feet of its course was opened, and one gate and two hydrants were so badly damaged as to be useless. The pipe was replaced by cast iron pipe, and the gate and hydrants by new gate and hydrants, the total cost of which was nearly $1,700. This loss is added to the maintenance account of the current year. Three times our main pipes have been struck by lightning, and each time is more alarmingly suggestive of what accidents may happen from the same cause. Cannot some electrician give us a plan of protection?"

On investigation it was found that the cement lined pipe was made as follows: The wrought iron shells were 8 feet long, made of about 18 gauge iron, lined on the inside with cement one-half inch thick, and covered on the outside with cement from one-half inch to one inch in thickness. In laying, the ends were butted together, over which is a sleeve filled with cement, about 6 inches in length, to make a water tight joint. In laying, the iron of one length does not usually come in contact with the iron of the next length, being separated by from one-eighth inch to one-fourth inch of cement.

In taking up the damaged pipe it was generally found burst from end to end; then for three or four lengths no trace of lightning could be discovered on the outside of the cement covering; but at each joint one to ten holes could be found punched from the outside of the pipe into it, from one-tenth of an inch to three-fourths of an inch in diameter; then a sleeve would be cut as smooth as could be done with a pair of snips; then a length burst; and then the lightning disappeared at a hydrant or gate.

The water mains of Fitchburg have been damaged seriously by lightning five times. In every case buildings have been struck, and the discharge has followed the supply pipes to the main; there it has divided and followed the main each way until it has reached a valve. In 1877 about 2,000 feet of mains were destroyed in one shower. In every case the damage has been confined to the old cement lined pipes.

It will be seen that the cement lined pipe when filled with water constitutes a Leyden jar, which is quickly ruptured by being heavily charged. It is manifestly unsafe to cover the iron mains with any insulating varnish unless metallic connection is made with each section of the main at the joints, and these joints are connected to the water by a unvarnished piece of iron or other metal. If cement lined water pipes are connected with the lightning rods, it is necessary to remove the cement at regular intervals to allow contact between the water and the iron of the pipes. It would be sufficient to insert pieces of iron here and there in the ce-

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ment, one end of such pieces being soldered to the iron of the pipe and the other end being in free contact with the water.

If the gas pipes are not insulated from each other at the joints, there can be no danger in connecting the lightning rods with them. The electrical continuity, however, of the gas pipes should be carefully ascertained. The practice of connecting telephone wires with gas pipes shows that in most cases this electrical continuity is insured by the present method of laying the pipes.

## ASPECTS OF THE PLANETS FOR JULY.

### VENUS

is evening star. She wins her old place at the head of the roll, if the interest attached to her movements and the lovely aspect she presents are made the standard of classification. She is now far enough advanced on her eastward course to be plainly seen by observers who carefully study her position in the heavens before attempting to find her.

Venus moves at a rapid pace during the month, being, at its commencement, southeast of Castor and Pollux in Gemini, and, at its close, southeast of Regulus in Leo. She must be looked for a little south of the sunset point on the 1st, and about 6° south of it on the 31st.

No lover of the stars can look unmoved on this charming planet, when, after an absence of nearly a year, she is first seen in the evening twilight as, tremulous with brightness, she floats on the golden waves that succeed the sunset.

Venus has won tributes of admiration since men first began to study the stars. The shepherds of olden times paid such homage to her surpassing beauty that she was called the Shepherd's Star. She was equally well known as Hesperus and Vesper. The whole world agreed in naming her for the goddess of love and beauty, and she richly deserves the proud titles of queen of the stars and fairest of the stars. Even grim Galileo had a touch of poetic sentiment when, suspecting her phases, and fearing that some one else might anticipate him, he concealed the discovery in an ingenious Latin transposition, that truly interpreted meant, "The mother of the loves imitates the phases of Cynthia."

No better time can be chosen for following the movements of the earth's twin sister than that when, emerging from the sun's eclipsing rays, she first appears in the western sky. Such is her present position. Once detected, she is sure of being found on each successive favorable night, oscillating eastward, slowly increasing in radiance and in the length of time she remains above the horizon. As the months roll on, she becomes the fairest object in the starlit sky for hours after the sun has sunk behind the western hills, reflecting his glorious radiance, and shining far more brightly than any of the myriad stars whose inherent light pierces the star depths from distances of which infinity is the measuring unit.

On the 17th, at 9 o'clock in the morning, Venus is in conjunction with Mercury, being at that time 11′ north. The conjunction is invisible, but a telescope will give a fine view of the two planets on the evening of the 17th. This conjunction of the two inner planets affords a good illustration of the velocity with which Mercury moves. Both planets are traveling from superior conjunction to eastern elongation. Venus passed the former goal on the 4th of May, and Mercury on the 26th of June, and yet the latter now overtakes and passes the former.

On the 27th, at 18 minutes past 7 o'clock in the evening, Venus pays her respects to Regulus, or Alpha Leonis, the bright star that lies in wait for the planets. At the time of conjunction, Venus is 1° 10′ north of Regulus. The event occurs too soon after sunset to be visible to the naked eye, but a telescope will reveal the actors in the scene. Venus will not linger in the vicinity of the star, for nothing can stay her course as she hastens to overtake the princely planet who is then not far in advance.

The right ascension of Venus on the 1st is 7 h. 51 m.; her declination is 22° 19′ north; her diameter is 10·4″; and she is in the constellation Gemini.

Venus sets on the 1st at 18 minutes after 8 o'clock in the evening; on the 31st she sets at 7 minutes after 8 o'clock.

### MERCURY

is evening star, his course lying near that of Venus. We have already referred to his conjunction with Venus on the 17th.

On the 26th, at 2 o'clock in the morning, Mercury is in conjunction with Regulus, being at the time 11′ south. Thus this star is in conjunction with two planets on two successive days. Though the conjunction is invisible, star and planet will be near together on the evening of the 26th. Sharp sighted observers may pick up the planet on the east of the star, if the sky be cloudless and the atmosphere be exceptionally clear, as Mercury is within a few days of eastern elongation.

The right ascension of Mercury on the 1st is 7 h. 5 m.; his declination is 24° 14′ north; his diameter is 5″; and he is in the constellation Gemini.

Mercury sets on the 1st soon after half past 7 o'clock in the evening; on the 31st he sets a few minutes after 8 o'clock.

### JUPITER

is evening star, and shares with Venus the place of honor on the midsummer annals. His luster is, however, diminishing, while that of his fair rival is increasing. As their paths lead in opposite directions, the former moving westward toward the sun, and the latter moving eastward from the sun, they must approach each other. The most interesting planetary event of the month will be to observe this gradual lessening of the space that separates the beautiful evening stars, and to note their close proximity at its close.

The right ascension of Jupiter on the 1st is 10 h. 19 m.; his declination is 11° 34′ north; his diameter is 31·6″; and he is in the constellation Leo.

Jupiter sets on the 1st soon after 10 o'clock in the evening; on the 31st he sets at 21 minutes after 8 o'clock.

### URANUS

is evening star. He has completed his passage of 7 years through the constellation Leo, and has entered the constellation Virgo, where he will be found for 7 years to come. He is almost stationary during the month, changing his place slightly to the southeast.

The right ascension of Uranus on the 1st is 11 h. 57 m.; his declination is 1° 2′ north; his diameter is 3·6″; and he is in the constellation Virgo.

Uranus sets on the 1st a few minutes after 11 o'clock in the evening; on the 31st he sets soon after 9 o'clock.

### NEPTUNE

is morning star, and leads the trio of planets that precede the sun.

The right ascension of Neptune on the 1st is 3 h. 30 m.; his declination is 17° 18′ north; his diameter is 2·5″; and he is in the constellation Taurus.

Neptune rises on the 1st at half past 1 o'clock in the morning; on the 31st he rises about half past 11 o'clock in the evening.

### SATURN

is morning star. Before the month closes he will be a conspicuous object, rising a few minutes before 2 o'clock. He is brilliant enough to be recognized on his own merits, needing no aid from stars in his immediate vicinity. Indeed, he reigns alone at present, being surrounded by no rivals to lessen the brightness of his shining. He has passed beyond the boundary line of Taurus, and commenced his passage through Gemini. He will remain here for the coming 2½ years, moving, as is his wont, now forward, now backward, and now standing still. At present, his motion is direct, or eastward.

On the 20th, at 1 o'clock in the afternoon, Saturn is in conjunction with Eta Geminorum, a star of the 3·3 magnitude. The conjunction is almost an occultation, for star and planet are only 1′ apart, and 1′ is a very small space in celestial measurement when the distance between visible objects is to be measured. These close conjunctions are called appulses. It is a rare event when a planet approaches so closely a star of the 3 magnitude.

The right ascension of Saturn on the 1st is 5 h. 57 m.; his declination is 22° 31′ north; his diameter is 15·6″; and he is in the constellation Gemini.

Saturn rises on the 1st soon after half-past 3 o'clock in the morning; on the 31st he rises a few minutes before 2 o'clock.

### MARS

is morning star. There are no changes during the month in the position of the planets on the east and west sides of the sun. At its close, Venus, Mercury, Jupiter, and Uranus are evening stars; Saturn, Mars, and Neptune are morning stars.

The right ascension of Mars on the 1st is 4 h. 29 m.; his declination is 21° 48′ north; his diameter is 4·4″; and he is in the constellation Taurus.

Mars rises on the 1st about a quarter after 2 o'clock in the morning; on the 30th he rises at half past 1 o'clock.

### THE MOON.

The July moon fulls on the 26th at 33 minutes past 6 o'clock in the afternoon. The moon in her last quarter is in conjunction with Neptune on the 8th at 6 h. 59 m. A.M., being at the time 2° 33′ south. She is at her nearest point to Mars on the 9th at 3 h. 44 m. P.M., being 5° 1′ south. She is in conjunction with Saturn on the 10th at 5 h. 48 m. P.M., being 4° 7′ south. She next draws near the evening stars. She is in conjunction with Mercury on the 13th at 6 h. 57 m. A.M., being 5° 39′ south, and with Venus four hours later, at 10 h. 21 m. A.M., being 5° 22′ south. She is in conjunction with Jupiter on the 15th, at 2 h. 2 m. A.M., being 3° 7′ south, and ends the circuit with a conjunction with Uranus on the 16th, at 6 h. 37 m. P.M., being at the time 34′ south.

### OCCULTATION OF ALDEBARAN.

On the 8th the moon occults Aldebaran, or Alpha Tauri, for the 7th time this year. The phenomenon will be visible in this vicinity. The immersion of the star takes place at 4 h. 25 m. A.M., Washington mean time. The immersion takes place at 5 h. 18 m. A.M., the occultation continuing 53 m. A telescope will be required for observation, as the presence of the sun will hide the actors in the scene from the naked eye.

### OCCULTATION OF URANUS.

The moon occults Uranus on the 16th, for the sixth time in the year. The phenomenon is visible to observers favorably situated according to time and place between the limiting parallels 2° north and 75° south. This means that their position must correspond to the position of the planet as seen from the earth's center, and they must be at the time on the dark side of the globe.

### JULY

is not unfruitful in planetary events. Jupiter and Venus, the most brilliant members of the sun's family, are visible in the west. They are approaching each other so rapidly that, though at the beginning of the month there is a difference of two hours in the time of their setting, they are only 15 minutes apart at its close. Mercury, though invisible, follows swiftly on the track of his more distinguished fellow planets passing Venus, and hastening to overtake Jupiter. Regulus comes in for its share of attention, both Mercury and Venus passing near its domain. Saturn treats us almost to an occultation, making an appulse to Eta Geminorum. Our fair neighbor, the moon, besides following her usual round, kindly occults Aldebaran for our observation, and hides Uranus from sight for the pleasure of observers farther south.

Midsummer nights are most favorable for the study of the stars. There is a delightful companionship in the society of the myriad twinkling mysteries that stud the canopy of night, a feeling of satisfaction in learning to know by name not only the planets, but the brilliant stars among which these wanderers tread their shining course with tireless feet.

An intelligent observer with the aid of a star map can easily trace the most brilliant of the July stars. The Great Bear is descending toward the northwest; Arcturus is lovely to behold as bathed in rosy light he nears the horizon. The brilliant Vega is approaching the zenith; below it the Northern Cross rests on the Milky Way; Altair beams brightly with its less brilliant companions on either side; the lone Spica shines in the southwest; and the constellation Scorpio, with its leading brilliant, Antares, is a charming object in the south. We give the outline for the sky about 9 o'clock, at the beginning of the month. The same outline will answer for its close, but the observation must be made two hours earlier.

## Economical Results of Natural Gas.

It is stated that with one exception every iron mill in Pittsburg will be using natural gas instead of coal by July 1. Those firms which have not already made the necessary arrangements to use it are taking advantage of the present stoppage to do so.

Forty iron firms within a radius of thirty miles are using it. Beside these, glass factories, breweries, distilleries, and other establishments are using it.

The finished output of iron and steel in the Pittsburg district is 750,000 tons a year. Assuming as a moderate estimate that it takes fifty bushels of coal to finish a ton, the general introduction of natural gas into the iron and steel mills supplants 38,250,000 bushels of coal a year, or about one-seventh of the annual output of the region tributary to Pittsburg. Thousands of men in addition to those who have already been affected by it will be thrown out of employment. In every mill it will do away with firemen, ashmen, and deliverers, and many a coal miner will have to seek new fields and the operators new markets for their product.

## A Profitable Dog.

An exchange tells of a man residing on the line of a railroad who has taught his dog to bark vociferously at every passing train. The impulse of the firemen is to watch for the barking dog, and hurl pieces of coal at him in passing. The result to the owner is that he has delivered at his door all the coal he requires for his own use free of cost, and is now contemplating the opening of a coal yard for the supply of his neighbors. He thinks he can compete in price with the oldest coal dealers in the vicinity.

## An Optical Experiment.

A contributor to *Cosmos* suggests a curious optical experiment which may serve to show the principle of the stereoscope. If we cut out of black paper two similar figures—two crosses, for example—and place them, their extremities almost touching, at about three inches from the eyes, before a sheet of white paper, we shall see three crosses, the middle one being dark and completely separate. This phenomenon is explained by the simultaneous vision of the two eyes, and it is easy to show this by looking at the objects successively with one eye. The experiment becomes still more interesting when, instead of black figures, we employ complementary colors—red and green, for example. In this case we must use a dark background, and there will appear a white cross in the middle.

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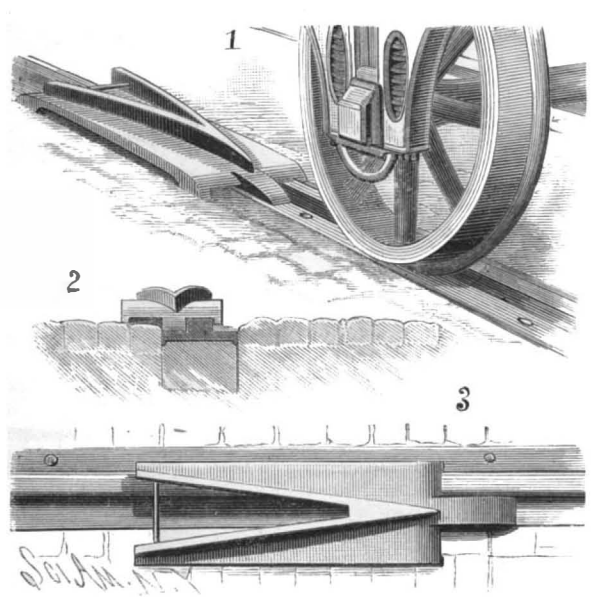
### IMPROVED CAR REPLACER.

The car replacer herewith shown, patented by Mr. Isaac Snow, of 413 Washington Street, New York city, is simple in construction, convenient in use, effective, and being light may be easily transported. Fig. 1 is a perspective view showing the replacer in position, Fig. 2 is a front elevation, and Fig. 3 a plan view. The cast iron plate is of sufficient width to rest upon the head of the rail and upon the pavement. At the middle of the forward end is an inclined tongue to rest against the side of the rail head and form an inclined plane

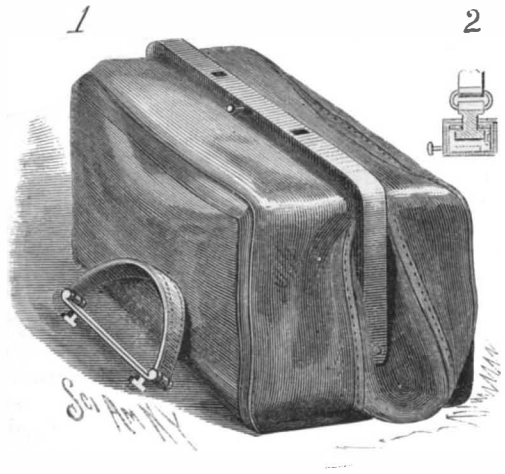



SNOW'S IMPROVED CAR REPLACER.

for the wheel flange to roll up upon. The plate is kept level by lugs projecting from each corner of the lower side. On the upper side of the plate is a V-shaped flange, the angle of which is at the forward end and in line with the center of the tongue. The rear ends of the flange are at such distance from the corners of the plate as to leave space for the wheel flanges between the ends and corners; the outer sides of the ends are at the line of the side of the head of the rail against which the lugs rest, so that when the wheel passes off the plate, the tread will come squarely upon the head of the rail. That part of the plate within the flange is cut away to make the replacer lighter, and the rear ends are strengthened by a cross rod. It will be seen that the replacer can be made so light and small as to be readily handled, and can be conveniently carried on a car, so as to be always at hand when needed. When the device is to be used for replacing steam cars, the supporting lugs are made of sufficient length to rest upon the ties when the plate rests upon the rail, so as to hold the replacer level.

### DETACHABLE HANDLE FOR VALISES.

The engraving shows a detachable handle and safety lock attachment for valises, satchels, etc., which has been patented by Mr. Charles White, of Osceola, Nebraska. The angle plate forming the top of the lock casing is provided with two transverse slots in its top and with a longitudinal slot in the side. The handle is secured on the ends of a plate from the bottom of which a T-shaped lug projects at each end. A slide arranged on an inside angle plate is moved by a pin projecting through the side slot until it is stopped by a stud. The lugs on the handle plate are then passed through the top slots and the pin released, when the




WHITE'S DETACHABLE HANDLE FOR VALISES.

slide is pushed in the opposite direction by a spring. The side edges of openings in the top of the slide pass over the lower parts of the lugs, thereby holding them and the handle in place. At the same time bolts are passed through lugs, whereby the valise is locked. The key is inserted and turned so as to lock the slide in place. To remove the handle, the key is turned so as to release the slides which may be then moved back by the pin. The handle can be removed from the valise—placed inside if desired—and cannot be replaced without the use of the key, thus rendering it difficult or impossible to carry away the valise. It will be understood that the valise can be locked with the handle in place or detached. The device is simple and strong, and affords travelers increased security, since it permits the leaving of baggage locked and yet without a handle.

### Fire-resisting Properties of Cyanite.

Some interesting tests of the fire-resisting properties of cyanite were afforded by the manufacturers of the material (the Patent Liquid Fireproof Cyanite Company, Limited) on Wednesday last, on the site of the abandoned Opera House, Victoria Embankment. The material is a liquid solution, of which silica is the basis, and it is applied with a brush directly to the surface of the woodwork, serving either as a priming to be afterward covered with paint, or as a stain in lieu of the ordinary pale oak stain, which it much resembles in color when applied to deal or other white woods, though it is also made colorless. It is claimed by the manufacturers that this solution sinks into the pores of the wood, and renders the timber for a considerable period proof against the attacks of fire. That the application of the solution has the effect of retarding the attacks of the flames for a long time was conclusively shown by the tests of Wednesday last.

These tests were four in number. For the first one a small flight of stairs, constructed of 1½ inch common white pine, was primed with two coats of cyanite, and underneath it a large heap of chips and shavings, plentifully besprinkled with benzoline, was ignited and burned for half an hour before the soffits of the treads and the backs of the rises were perceptibly charred. After the lapse of another half hour, during which the under part of the woodwork of the stairs continued to smoulder, the stairs were proved to be strong enough to bear the weight of a man. Other tests, with packing cases, were equally successful. The cases (three in number) were each about 2 feet 6 inches deep, 3 feet 6 inches long, and 2 feet 6 inches broad. They were each stood up on end, and a large fire of shavings and chips sprinkled with benzoline was lighted in each. One of the cases was not coated with cyanite, and it speedily collapsed and became a mass of charred embers. The two other cases retained their form and position after the lapse of an hour, and it was only after the first half hour's exposure to the flames that the wood became perceptibly charred and began to burn to any appreciable extent. It is asserted that this solution is permanent in effect, and does not injuriously affect the woodwork to which it may be applied. If this be so, the solution has a wide field of usefulness open to it.—*The Builder.*

### Changes in the Rings of Saturn.

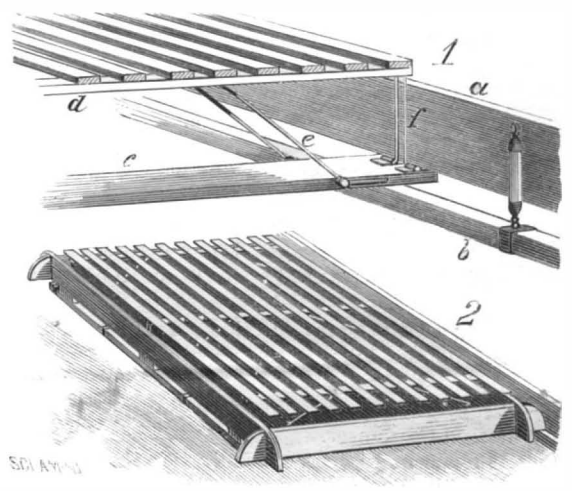
Some interesting remarks on the planet Saturn have been communicated to the French Academy of Sciences by M. Trouvelot. They are the result of observations made on the planet at the observatory of Meudon by the refracting telescope there. The ring A of the planet has undergone some changes in position and variation of size. The division of Encke has approached the division of Cassini; and the straight zone between these two divisions has appeared less brilliant than during last year. Variations have also been observed in the rings B and C, the latter being pale, diffused, and badly defined on its interior edge. The shadow of the globe of Saturn on the ring B appears angular, as it was last year; but it has evidently shifted its position somewhat. With regard to the globe of the planet itself, M. Trouvelot has not remarked many changes in it. The intensity of the color of the south polar cap diminished toward the beginning of February, and the zone next it was enlarged in the early part of March. The observations tend to confirm the conclusions that the rings of Saturn are variable.

### Mourning Ink.

The best shining black ink, used for mourning paper, and the manufacture of which has up to the present time been kept a secret by makers, may be prepared, according to the *Papier Zeitung*, of lampblack, borax, and shellac. The ink is made as follows: In 1 liter of hot water 60 grammes of borax are dissolved, and to this solution three times the quantity of shellac is added. After this mixture has been properly dissolved, the necessary quantity of lampblack is added, the whole being constantly stirred. Should the luster not be satisfactory, more shellac is added.

### SPRING FRAME FOR BEDS.

The spring frame herewith illustrated can be used in beds, sofas, chairs, etc., and is very elastic and strong, and can be easily taken apart for transportation or storage. Rubber or spiral or other springs have their upper ends secured to the inner surfaces of the rails, *a*, and their lower ends secured by clips to the bars, *b*, which are thus held a short distance below the rails. On the bars rest three or more crosspieces, *c*, to each end of each of which is fastened a spring, *e*, consisting of a U-shaped wire having a coil formed in each shank, and the free ends being bent inward and pointed. These points are driven into the side edges of the cross bars, and nails are driven into the bars through the coils or eyes. On the upper ends of the springs rest the bars, *d*, which carry the slats. Upright wire frames, *f*, on the bars, *e*, rest against the inner surfaces of the side rails, and are secured by screws to the ends of the bars, *d*; these frames guide the bars, *d*, and limit their movement, as the top of the spring frame works up and down. The pressure on the slats is transmitted to the bars, *d*, then by the springs, *e*, to the bars, *c*, suspended from the rubber springs; the strain on the springs is taken up by the side rails and end pieces, which are supported by the bed frame. The side rails



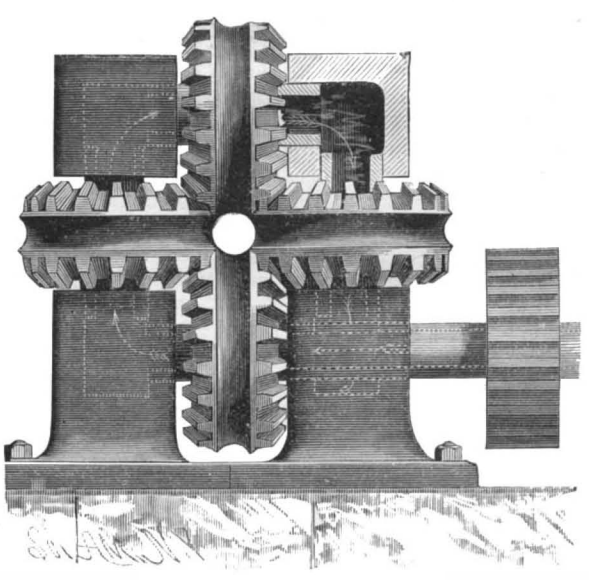

TAYLOR'S SPRING FRAME FOR BEDS.

and end pieces are notched for the purpose of locking them together.

This invention has been patented by Mr. Benjamin Taylor, of Morrillton, Ark.

### ROLLING MILL.

The engraving represents an elevation of an improved rolling mill, one side of the housing for the rolls being removed. The object of the invention is to overcome that universal defect in round bars of iron produced by the ordinary process of rolling, which is by passing them successively between two rolls, each having a half-round groove of the size required for all sized bars. This defect consists in the splitting up of the central portion of the bar into thread-like fibers, so that, after the outer portion is turned off to true it, and then a screw is cut, sections of the thread of the screw will frequently come off while being cut. This is well known to all workers in commercial round bar iron, and is caused by being rolled with the pressure on but two sides at once, and then turned and the pressure brought on the two opposite sides. This causes a lateral motion of the interior particles and a consequent separation in that direction as the cooling advances. This defect is entirely overcome by using four rolls, as shown, instead of two, so that no lateral motion is possible, the pressure being constant toward a common center. In this way a perfectly solid bar can be produced from the same material, worth a great deal more than the ordinary round bars. In addition to this it can be produced much more rapidly and at much less



CRANDELL'S ROLLING MILL.

cost. Instead of two sets of hands to pass the bars back and forth until finished, two men to take the iron from the fire and start it in the first set of rolls is all that would be required, as the rolls are to be arranged in sizes, one set behind the other, so that as the metal bar emerges from one set it enters the next in size, and so continues until reduced to the size required, without being again touched by the operative.

This invention has been patented by Mr. A. Crandell; particulars can be obtained from Mr. Germond Crandell, 610 H Street, N. W. Washington, D. C.

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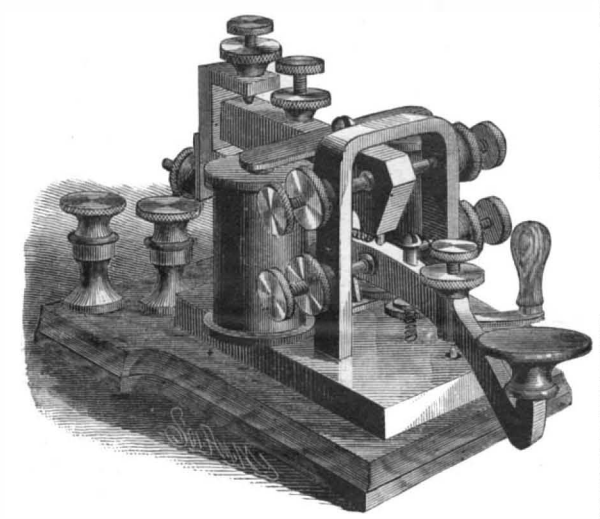
### TELEGRAPH KEY AND SOUNDER.

Mounted on the wooden base of the instrument is a metal plate carrying the magnet and arch. Hung on the arch is the sounder tongue, and just back of the center of the magnet is a post provided with the contact screw of the sounder. These parts constitute the sounder as ordinarily constructed. In front of the finger key, which is hung on the arch by trunnion screws, is the spring of the key, and in front of this is the front contact point insulated from the base, and the adjusting screw of the base. The rear end of the key extends between the helices of the magnet, and has a stop projection taking on the connecting piece of the magnet, so as to serve as a back point. The two rear binding posts are connected to the sounder magnet by wires. Just forward of these are



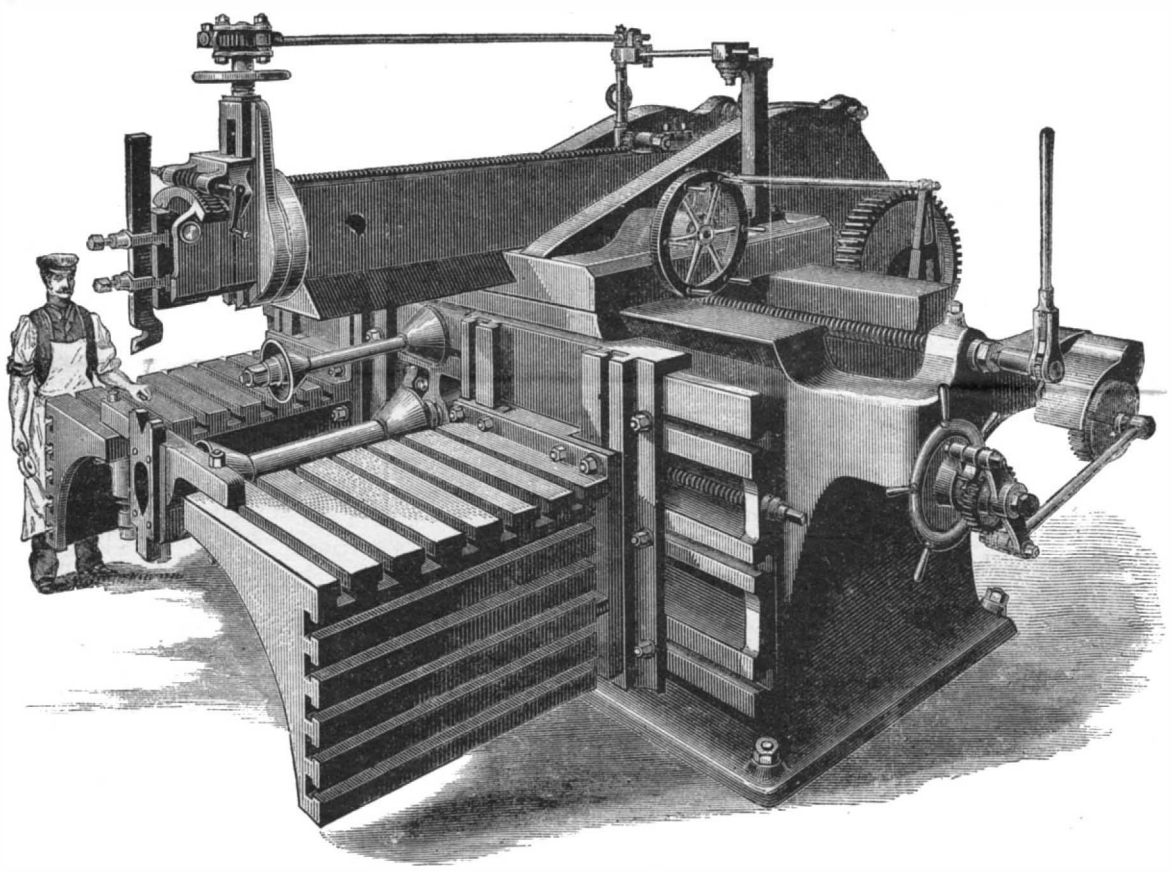
BELT'S TELEGRAPH KEY AND SOUNDER.

the binding posts for the finger key, which are connected by wires to the metal base and the front contact, the latter connection also extending to the switch anvil. These connections are for use when a relay is required, but for a local sounder on short lines only two posts are required. The key may extend out in the opposite direction to that shown in the engraving, or at the back of the instrument.

This combined key and sounder—recently patented by Mr. Perley P. Belt, of Columbus, Kansas—is very compact, occupying no more space than the ordinary sounder, besides being less expensive than separate instruments.

### IMPROVED SHAPING MACHINE.

Our engraving illustrates an unusually large shaping machine manufactured by James Archdale & Co., Birmingham. The length of stroke of this fine machine is 3 feet, the longitudinal traverse of the saddle 9 feet, the length of bed 12 feet; the total length of the bed over the bracket at end is 18 feet, the tables project 4 feet 3 inches, the vertical movement of the tables is 18 inches, the power of the gearing is 12 to 1 and 20 to 1; there is a quick return stroke. There are cast steel link connecting rods and feed wheels. The tables are constructed to sustain a weight of 12 tons to 15 tons. The machine is self-acting in all cuts, and has two circular motions for large and small work. The total weight is 24 tons, the ground space taken up is 20 feet by 18 feet. The main frame of the machine is cast in one piece and strongly ribbed inside to give necessary strength. The foot of the frame is extended to the left to support the driving gear. The weight of this frame or body is 11 tons. The driving gear, etc., consists of a five speed cone pulley, 20 inches to 36 inches in diameter, and two changes of spur gear. The changes are effected by a screw on the pulley shaft, the boss of the hand wheel being cut as a nut internally and split, and provided on its outer diameter with a split grip for locking. By moving this hand wheel the pinions can be brought in and out of gear with heir respective wheels, and locked in position on the shaft. These wheels give motion to a strong back shaft having a key bed and sliding pinion carried in a bracket at the back of the traveling head or saddle. This bracket and saddle are all one casting. This pinion works into a powerful spur wheel keyed fast on the main crank shaft, also carried in a bearing at back of saddle. The saddle or traveling head weighs 3 tons, and has carried from it at the back and hanging downward two strong brackets for the support of the main gear. The crank is variable, and the sliding block is moved in the crank plate by a rack and pinion, and is fastened in the desired place by two lock nuts. This crank actuates a cast steel link and connecting rod, and gives a quick return stroke, the connecting rod being inside the ram, thus giving a central thrust. The saddle is self-acted either way along the bed by a slotted disk, connecting rod catch, and cast steel wheels, the screw being locked and stationary, the nut —having a spur wheel on a friction cone—turning in a bearing cast on the saddle underneath, and thus moving the saddle. When it is desired to move the saddle along more quickly, the screw is unlocked at each end of the bed, and a ratchet or handle applied at one end and moved direct. The ram is 13 feet 6 inches long and two tons weight, and has a quadrant tool box for shaping internal or external curves. It also has a noiseless and improved self-acting down-cutting motion. The ram is moved forward or back when being adjusted to the requisite stroke by a pinion working into a rack. There are, as we have said, two circular motions, with minimum feeds of $\frac{1}{1020}$ and $\frac{1}{2400}$ of a revolution respectively. The smaller one will take about 24 inches diameter, and the larger one about 48 inches. It is supplied with suitable mandrels and cones, and also a steady bracket supported on both tables. The two tables weigh about 3 tons each, and project 4 feet 3 inches from the bed of the machine, and are moved longitudinally by means of screws, and vertically by powerful worm wheels and worm and screw.—*The Engineer.*



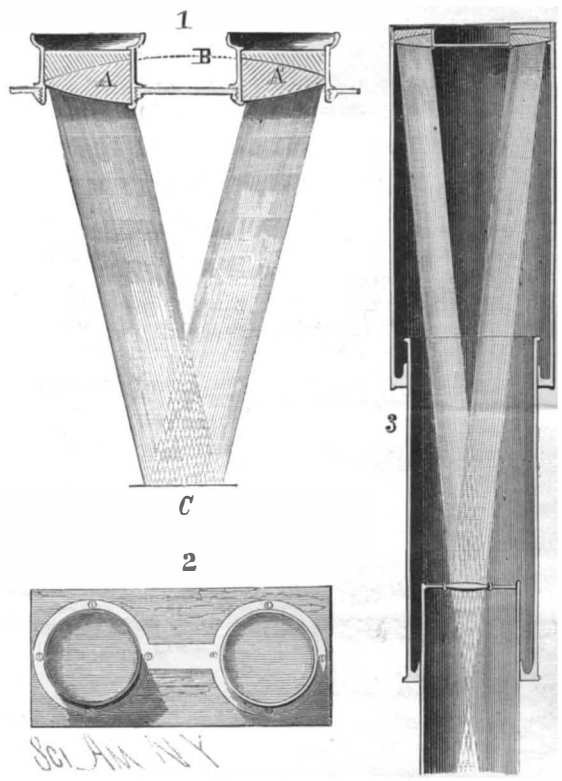
IMPROVED SHAPING MACHINE.

### Better Pyrometers Needed.

At a recent general meeting of the German Union of Manufacturers of Refractory Products, the subject of pyrometers was discussed. Herr Seger, an authority on the subject, stated that so far no pyrometer of any kind had given satisfaction to a sufficient degree to establish it in use and favor. For temperatures over 500 deg. Cent. they are not reliable, and cannot be used for such purposes as regulating the temperature of ovens in porcelain manufacture, etc. The electric pyrometer of Siemens is not safe, even with careful handling, as after being used several times different pyrometers hardly ever give corresponding readings. This apparatus also requires very frequent repairs. In many works so called "pyroscopes" are employed with advantage to approximately regulate and judge of the temperature of ovens and furnaces. Alloys of gold and silver, and of gold and platinum, of varying proportions, are used, but such alloys are only recommended up to temperatures of about 1,200 deg. Cent. In firebrick and porcelain works use is made of a graduated series of mixtures of fireclay and ground feldspar, also of feldspar, quartz, and fireclay. These mixtures are made into cubes of 2 to 3 centimeters in height, and are placed so that they can be seen through little spy holes left for the purpose in the side of the furnaces. They give way at first, by the rounding off of the corners, when the fusion temperature has been reached.

### OBJECT LENS FOR TELESCOPES AND CAMERAS.

This invention has a twofold object: to obtain the effect of a lens of large diameter without the labor and expense required for the production of large lenses; and to improve photographic pictures by the use of lenses, which serve to intensify the image and




OBJECT LENS FOR TELESCOPES AND CAMERAS.

produce a stereoscopic effect in the picture. The lens is of compound or double form, each portion being ground to the curvature of a solid lens of the required diameter, and the two parts being held in their support so as to be retained in the same relative position with regard to each other that they would sustain in a solid lens of the same diameter and curvature. The lens is composed of the two parts, A, which are constructed by securing two disks of glass in the same plane and then grinding them to the curvature of a solid lens of like diameter. These are then secured or set in a frame made of any suitable material. For telescopes the setting may be of some inferior glass, or it may be, as shown in Fig. 2, similar to those used in opera glasses. The same effect may be obtained by taking an ordinary lens and by diaphragms or other means, rendering it opaque except at diametrically opposite portions. It will be understood that in cameras this construction applies to the front or object lens, the condensing lens, C, being applied as usual.

This invention has been patented by Messrs. J. A. Smith and A. J. Athay; further particulars can be had by addressing the latter at Sparland, Ill.

### Starch.

The principal grain from which starch is manufactured at the present time is Indian corn—wheat and potatoes being used in limited quantities.

There are twenty-four factories in the United States manufacturing starch from corn. Fifteen of these are working under the new method, or chemical process, and producing about two-thirds of the total amount made per annum. The balance work by the old method, or fermentation process.

Indiana is the leading State of the Union in the production of starch from corn, having eight factories and producing more than one-third of the total amount made.

The total capacity of the mills manufacturing starch from corn is about 250,000,000 pounds per annum. The total number of pounds of starch of all kinds exported from the United States in the twelve months ending July 1, 1883, was 7,033,715.

The consumption of starch for all purposes in the United States is about 160,000,000 million pounds per annum, or an average of three pounds for each person.

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## THE GREAT FRENCH GUN.

(*Continued from first page*).

does, in a longitudinal direction. In the usual method of hooping it is friction alone that unites the tube and the different superposed series of hoops longitudinally. Now, it is easy to see that such friction is not sufficient to prevent unbreeching. A few slight errors in construction would, in fact, prove of a nature to diminish or even locally suppress the tightness, so that, upon bursting, the tube would slide in the hoops that encircle it.

This grave trouble is done away with in the system of biconical hooping. Col. De Bange has applied his new system to the gun under consideration. The tube of this is strengthened by four series of hoops, which, by reason of their shape, fit into each other, while their joints overlap, after the manner of brickwork. The putting of these in place is very simple. It suffices to heat them to a blue heat, that is to 300 or 400 degrees C., in order to obtain the necessary tightness. The hoops once put on, the constructor had to proceed to the turning. This operation was performed in a machine tool whose cutter moves forward in order to remove the steel shaving, while the tube revolves round its axis. The chamber of the piece was afterward provided with 144 grooves, 0·06 of an inch deep, that had an initial pitch of 30 minutes and a final one of 7 degrees. This rifling was effected by means of another machine tool, which also is very remarkable. In this apparatus the piece is stationary, while the tool moves in order to cut the spirals.

We shall now say a few words about the platform, frame, and carriage, the dimensions and weight of which are in keeping with those of the tube (Fig. 2).

The platform consists of three courses of superposed timbers, of 12 inches section, buried in ballast which rests upon a bed of beton. The great frame weighs 20 tons, and the carriage, inclusive of brake, 22 tons. These two apparatus present a few original and extremely ingenious arrangements. In the first place, we remark an inclined crank, which connects the carriage with the pumps, and moderates the lifting of it. Next, we would call attention to an eccentric roller that operates automatically in the rear, and the importance of which will be at once seen. It is necessary, in fact, that, during its recoil, the carriage shall *slide* over the frame by its back part, and, on the contrary, that when it is put in battery again, it shall *roll* over the said frame. This condition is fulfilled by the eccentric roller placed under the butt end of the carriage, and which a Belleville spring acts upon at the right moment.

Behind the carriage there is an inclined chain, which is connected through other Belleville springs with the hind crosspiece of the frame. When a gun is being put in battery, the velocity of the forward motion is great, despite the play of the pumps, and so it is usual to deaden the shock by means of buffers affixed to the front of the carriage. This arrangement, which has hitherto been everywhere employed, does not prevent the whole from undergoing violent shocks, seeing that the action of the buffers is exerted very low down with respect to the center of gravity. The chain under consideration has the effect of slowing up the forward motion, and of consequently reducing the shock. In the rear of the frame there are buffers also, for use in cases where, through some breakage, the hydraulic brake might not act.

Finally, we would call attention to the bolster, which is very wide, and the axis of which passes through the center of gravity of the entire affair. The reason for this new arrangement is as follows: The majority of the large frames now in use rest upon the platform through the intermedium of a bolster and wheels or rollers. Now, experience has shown that these latter are subject to get out of true, and, indeed, often do so. The arrangement here adopted permits of suppressing these, seeing that the entire system is in equilibrium upon it, and easily adapts itself to every change of direction. As the bolster bolt passes through the center of gravity of the system, the piece's firing field is 360 degrees.

The carriage includes a platform for loading, situated about 8 feet above ground. As for the trunnions, they are 11½ feet above ground. A crane, maneuvered by a sort of pump, serves to lift the projectile to the level of the breech. For aiming, the piece carries at its lower point, below the trunnions, a toothed arc, which is acted upon by means of gearings maneuvered from the exterior.

The axis of the piece may be inclined 30 degrees above and 15 below the horizon. Once loaded, the gun is in perfect equilibrium upon its trunnions.

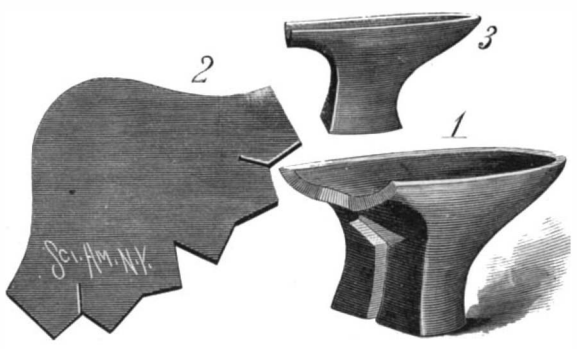
The largest gun that the Krupp works have as yet turned out is of 17 inches caliber, and has an initial velocity of but about 1,500 feet. It is worth $300,000. De Bange's new piece will cost notably less, and its velocity, as we have stated, is 2,130 feet. Owing to the system of hooping, which constitutes its principal original feature, it fulfills all the conditions of security, lightness, and economy that could be required.

This gun is, above all things, a marine one, that is to say, it is capable of being mounted in battery aboard a ship of war, or concur effectively in the defense of the most valuable points of our coast. It may also be used as a siege gun. In a siege, especially, excellent service may be expected from it, seeing that the limit of range of all pieces known up to the present is but 6 miles, while that of the one under consideration is, as we have said, from 10 to 11.—*La Nature.*

## MACHINE FOR FORMING HEELS FOR LADIES' SHOES.

To make the high, curved heels, with small bottoms, so commonly used on ladies' shoes, and generally designated in the shoe trade as the "Louis Quinze" style, was one of the most troublesome tasks of the old-time shoemaker, and is so now where the heel is built up by hand from separate "lifts" of sole leather. The latter method is now seldom followed in this country, though it is to a much greater extent in European hand-made shoes; but our manufacturers largely use a wood or other formed heel, covered with some thin leather, and making a light heel, which, especially in goods of moderate cost, will not stand much service and look well. The invention herewith illustrated indicates a new way of making this class of heels, in which good, solid sole leather can be perfectly shaped into the desired form, and made the covering and protector of the wood or other filling used in the body of the heel.

In our engraving, Fig. 2 shows the sole leather blank used for such form of heel, as given in the different views in Figs. 1 and 3, Fig. 1 indicating the shape in which the blank comes from the former. The invention consists in a die with a recess or cavity shaped the same as the heel to be made, and with its front end open, to be closed by a U-shaped crosspiece with dowels passed into apertures in the front end of the die. The top plate of the die is made of the shape it is desired to have the heel seat, and the bottom plate may be set at




SHOE HEEL FORMED FROM LEATHER BLANK.

such angle as required to give an inclination to the bottom of the heel from front to rear. With the sole leather properly wetted, it is not a minute's work to press the blank into shape in the die, adjust the different parts, and pass the die into a press, where it is allowed to remain a few minutes, the operator being supposed to have several sets of dies, so that when the last has been thus put into the press the first will be ready to come out, and the work will thus be continuous. This die, can, of course, be used with lighter leathers, and, there being no opening in it except at the front, the entire surface is certain to have a smooth, unbroken finish; but it leaves nothing to be desired in the forming of a good, solid, sole leather covered heel, which cannot get out of shape, which may be brilliantly burnished, and which cannot fail to have excellent wearing qualities.

This invention has been patented by Mr. Friederich Ortlepp; all further information can be obtained from Mr. Joseph S. Kaliske, 79 Reade Street, New York city.

### A Good Idea.

According to our English contemporaries, the practice of litigants conducting their cases in person is one that seems to be daily gaining ground in England. Occasionally a jury will make strange blunders, says a writer, but, as a rule, what they want is to have the facts brought fairly before them. This a counsel often does not do. He is thinking of the rules of evidence, or he fancies that it would be politic to suppress this particular fact or to avoid that particular circumstance, or in some other way to finesse the evidence. This is what a jury dislike. They can get on much better with a litigant in person who blurts everything out with a supreme contempt for all established rules, and who, if a thing is not evidence, will somehow make it so.

### A Steam Canal Boat.

A canal steamer on a new principle is to be built at Albion, N. Y. This novel boat will be 98 feet long and 17 feet 8 inches in width; her boiler will be 10 feet long, 5 foot shell, with the fire box in the center of the boiler. The boiler will be horizontal instead of upright, and run athwartship instead of fore and aft, with an engine of full capacity. There will also be built three consorts for this steamer, with a capacity of 25,000 bushels of wheat, while the steamer's capacity will be 6,000 bushels, making an entire capacity of 31,000 bushels. The steamer, when on the river, will have one consort ahead of her and one on each side, and on the canal one ahead and two behind.

### New England Spruce.

The lumber used in the construction of a building in the Eastern States, is totally different from that used in any other locality. To the Pennsylvania man there is no wood for framing purposes equal to hemlock; the Michigan man is equally as firm in his opinion of white pine; but let either of these men advance his theories to the New England builder, and he would find he had met an equally strong adherent to the use of spruce. For framing purposes spruce is used almost exclusively. For boarding in, it is the custom to use hemlock or matched white pine, according to the quality of the work desired. Hemlock is generally used for under and spruce for upper floors, and in many instances a preference is shown for spruce ceiling over white pine.

The most extensive spruce forests are in Maine, and most of the lumber cut in that State is shipped by water to the various distributing points. The mills in New Hampshire and Vermont supply the interior points and deliver necessarily by rail. The mills which make a specialty of flooring are generally equipped with the best of machinery for dressing, and not a few have first class dry kilns. Undoubtedly the manufacturers of dressed spruce realize that to sustain the demand much depends upon the quality of the mill work, and the result has been that in the past few years especial attention has been paid to that branch of the business. Dealers whose yards are located at points along the eastern coast generally purchase of the manufacturers, who ship from the Kennebec or Penobscot rivers. It is customary to make up cargoes of random sizes and rough boards, which of course are sorted for sizes at their destination. Schedules of special sizes are also shipped in this way. Floor boards, if dressed, are generally shipped in box cars. In the matter of dressing, some prefer flooring dressed one side and jointed; others will use it dressed one side and matched. The latter method, in case the boards are not thoroughly dry, is undoubtedly the better.

Some idea of the spruce business of the Boston market can be obtained from the returns to the Inspector General's office for the first three months of the present year. During that time there was inspected 848,294 ft. of spruce boards and 1,171,167 ft. of plank and timber. In addition to this amount, there were many car loads of boards which arrived from mills in Vermont and New Hampshire which were sold from the car and no returns made. The present quotation on random cargoes—by that is meant ordinary sizes of framing timber—is from $12.50 to $13.50; special schedules by rail, $13.50 to $14.50. First clear spruce floor boards sell in eastern Massachusetts at $18 to $18.50, and second clear at $2 a thousand less.—*N. W. Lumberman.*

### Piping Blackbirds.

When reared by hand from the nest, the blackbird is capable of forming strong attachments, and from his wonderful imitative powers will make himself a great favorite. He will, if trained when young, learn to whistle almost any tune that may be taught him. The best, and perhaps the quickest, way is to take him, when about six weeks or not later than two months old, to a quiet room away from any other bird, and in the evening and the first thing in the morning give him his lesson. The tune may be played on a flute or other wind instrument. It is advisable to feed him *before* commencing operations; and some bribe or other, as, for instance, a lively worm, should be placed in his sight. Play over a portion of the tune you wish him to learn, and he will evidently pay particular attention to it. Repeat it, with precisely the same time and expression, say twenty times; then give the bird a little quiet, so that he may, if he will, have an opportunity of imitating it. If he should make any attempt, instantly give him his reward, coaxing and caressing him meanwhile. Being, for a bird, possessed of strong reasoning powers, he will soon discover why the worm or other bribe is given him, and before long will understand how to earn it. When once learnt, the tune or tunes will never be forgotten, but pass, as it were, into its song. It is rather a tedious undertaking, but the result is invariably satisfactory. A blackbird will also imitate other birds very minutely, and though there is little variety in his natural song, it is made up for by its pure, flute-like tone and full volume. It most readily imitates the thrush, but it will catch many notes from the nightingale, to which bird its tone has most resemblance, were it not for the introduction of several harsh notes. When kept in confinement, it is always advisable to bring it up when young near to some good singing bird, as it will thereby learn its neighbor's song, and, intermixing the notes with its own, make a most agreeable songster.—*Canaries and Cagebirds.*

IT may be of interest to those who preserve and bind the SCIENTIFIC AMERICAN to know what the law considers this paper to be worth per page. We take the following from the N. Y. *Sun:* "John Fallon, a well dressed, intelligent looking young man, who refused to say where he lived, was held in $100 bail yesterday for tearing a leaf from a copy of the SCIENTIFIC AMERICAN in the Astor Library.

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### New War Ships.

The Govanni Bausan, which has been built by Armstrong & Co. for the Italian Government, has completed the necessary trials, and is about to leave England for the Mediterranean. This vessel has been built generally after the design of the Esmeralda, but is somewhat larger, her length being 280 feet; breadth, 42 feet; and draught 18½ feet. Her displacement is about 3,100 tons. The armored deck in this vessel is 1½ inches thick. The armament consists of two 10-inch 25-ton breech-loading guns as bow and stern chasers, six 6-inch 4-ton guns on the broadsides, two 6-pounder rapid-firing guns, and several Nordenfelt and Hotchkiss machine guns. What is described as a revolving turret is placed at each masthead; in each of these a machine gun will be placed. On the gun carriages steel shields are fixed for the protection of men against lighter missiles. There is a torpedo ejecting tube beneath the ram for the under-water discharge, and two above-water discharges forward. There is a powerful hydraulic crane for lifting boats, and the steering gear is on the Elswick hydraulic principle. On the official trial, which was made about a fortnight ago, the vessel was run at full speed for six hours, forced draught being used all the time. The indicated horse power was about 6,000, the revolutions averaged 116·5 per minute, and the speed was 17½ knots per hour, or about 20 miles.

After years of trial and experiment, her Majesty's torpedo ram Polyphemus is pronounced complete. This interesting vessel lately left Portsmouth Dockyard for a full power trial in the Solent. By means of forced draught, the fan engines running over a thousand revolutions a minute, the boiler pressure was brought up to the standard of 110 pounds. The mean power of the engines was 5,520 horse power indicated; the maximum reached on the run was 5,780 indicated horse power. Four runs were made upon the mile, which showed that the vessel was steaming at the rate of 17·847 knots. This was on a draught of 20 feet forward and 21 feet 3 inches aft. Trials have also been made with the broadside torpedo discharging gear which gave so much trouble at first, and the result has been that the Whiteheads can be ejected at full speed without jamming.

The Aquidabau, the new Brazilian armor-clad, has recently been completed by Messrs. Samuda Brothers, and lately ran a very successful series of trials off the Maplin. This vessel is of the same general description as the Riachuelo. The new vessel is 280 feet long and 52 feet wide, the displacement being 5,000 tons. The mean draught on trial was 18 feet, the vessel having been designed not to draw much water, as she is required for service in the South American rivers. The hull is built of Siemens steel and sheathed with wood. The ram is a solid gun metal casting, and the stern frame is of the same material. The machinery is protected by a water line belt of steel-faced armor, 11 inches maximum thickness and 7 feet wide. There is an armored deck 2 inches thick, carried fore and aft, and arranged to protect the steering gear aft, and also to strengthen the ram. The armament consists of four 9-inch 20-ton breechloading guns, placed in turrets protected by 10 inch armor. On the upper deck there are two 5¾-inch breechloading guns at the bow and two similar weapons at the stern. There are fifteen Nordenfelt guns, and five ports for the discharge of torpedoes. The engines are by Messrs. Humphrys, Tennant & Co., and are of the three-cylinder compound type. The Aquidabau was tried in sea-going trim on the 16th ult. With natural draught the indicated horse power was 5,270, and the speed 15·257 knots. With closed stokeholds and fan draught the power was raised to 6,201 indicated horse power, and the speed 15·818 knots. In the forced draught trial only six of the total number of eight boilers were used. Two runs on the mile were made with only one screw working, the speed being at the rate of 11·447 knots, 15 degrees of helm being required to keep the ship straight. A half circle was turned against the screw in 3½ minutes. A six hours' coal trial was made on the 19th ult. The official report states that the consumption was at the rate of 45 tons a day when the ship was steaming at her contract speed of 14 knots. As the coal bunkers carry 800 tons, the Aquidabau could steam over seventeen days on her bunker coal, and cover a distance of above 5,700 knots.

### American Locomotives in New Zealand.

On the subject of American *vs.* English machinery, Sir Julius Vogel, ex-Agent-General for New Zealand, made a very interesting statement at Auckland on February 17. Sir Julius, who is now the Colonial Treasurer, spoke for several hours on the past, present, and future of New Zealand, and in the course of his speech used the following language:

"We sent home an order for certain locomotives after a type which we had running in the colony, and which were obtained from America. It was thought by the late government that it was unpatriotic to go to America for goods, so the plans and specifications were sent home to England, and the weights and sizes given most exactly. When these locomotives were about finished, the engineers telegraphed out that they were about to ship them, but that we had better order plant to strengthen our bridges and culverts, as it would not be safe to send the locomotives over them. Their idea was that we should make our railways to suit their engines. We telegraphed that we should do nothing of the kind, that we had limited the weight of the engines. They replied they could not be made according to the specifications we had supplied. But the answer to that was that we had them running in the colony, and we refused to take them. Well, this is what happened: We sent an order by telegraph to America for these engines, and such is the confidence we feel in the character of the material which will be supplied that we are prepared to take them without inspection there, while we cannot take the suspected ones from Great Britain."

Sir Julius also made use of the following language: "I cannot help saying that under the free trade system of Great Britain there has been a great deal of scamped work and adulteration going on, and that buying in the cheapest market and supplying as cheaply as possible, manufacturers have been in the habit of not conscientiously supplying the best articles. It is only quite recently that by a happy accident—an iron axle falling to the ground and breaking while being unshipped—we were saved from sending forth death and destruction on our railways by using rotten axles sent out from Great Britain."

### Australian Timber.

For constructive purposes in dockyards, piers, bridges, house carpentry, coachmakers' and wheelwrights' work, railway building, fencing, and piles, nearly the whole of the *Myrtacea*, of which New South Wales possesses something like fifty varieties, are extremely valuable, and certain of them incomparably so. For the uses of the cabinetmaker and the house decorator, the timber familiarly known as the black apple, the Moreton Bay pine, the red cedar, coach wood, Clarence light yellow wood, turnip wood, rose wood, Illawarra mountain ash, tulip wood, myall, cypress pine, and others, is capable of being worked up into furniture and paneling, beautiful in grain, rich in color, and susceptible of a high polish. The timber of the prickly leaved ti-tree (*Melaleuca styphelioides*) is said to be incapable of decay; that of the white ti-tree (*Melaleuca leucadendron*) is said to be imperishable under ground; that of the turpentine tree (*Syncarpia laurifolia*) resists the attacks of the *Teredo navalis* in salt water; and that of the brush bastard or white box (*Tristania conferta*) has been known to preserve its soundness, when employed in building the ribs of a ship, for a period of thirty years. To the carver and wood engraver the cork wood (*Duboisia myoporoides*), the rose wood (*Dysoxylon Frasernum*), and the pittosporum (*undulatum*) commend themselves as serviceable substitute, for European box; while the cooper finds in the native ash (*Flindersia Australis*), the silky oak (*Grevillea robusta*), the stave wood (*Tarrietea actinodendron*), the green and silver wattle (*Acacia decurrens* and *Acacia dealbata*), and the swamp oak (*Casuarina quadrivalvis*), excellent material for staves. Other kinds of timber are specially adapted for oars, spokes, and naves, tool handles, telegraph poles, and turners' work.

### The Electric Lighting of Trains in Germany.

The railway administration at Frankfort-on-the-Main have recently repeated some experiments on the lighting of trains by electricity, which, according to our foreign exchanges, have been attended by most satisfactory results. The experimental train was composed of a first, second, and third class carriage, and a luggage van, which contained a special compartment for the dynamo and accumulators. The dynamo was of the Moehring type, and was driven by a suitable arrangement of pulleys and belts from the axle of the wheels of the van, and at a velocity of 700 revolutions per minute, when the train was running at a speed of 18 to 42 miles an hour. When the train is running at full speed, the lamps remain in circuit while the accumulators are being charged; but when the speed is less than 18 miles per hour, then the lamps are thrown out of circuit, and the current is supplied direct from the accumulators, a specially constructed automatic commutator regulating its intensity. During the day the lamps are thrown out of circuit, and the 26 accumulators are charged by the dynamo when the train is in motion.

The train was lighted by 12 incandescent lamps, of which two were in the luggage van, two in the third class carriage, four in the first, and the remaining four in the second class carriage.

These experiments clearly demonstrate, says a contemporary, the practicability of lighting trains by electricity, the light being perfectly steady during the journey, and at variable speed, and even during stoppages at stations: only at starting a slight oscillation was perceptible. As all is regulated automatically, no attendant is required, except at starting. The experiments were continued for six weeks, at the end of which time everything was found in perfect order. The cost of lighting is estimated at ten centimes per lamp per hour.

### Photo-Mechanical Processes of Illustration.

THE ARTOTYPE.

The artotype is made in the following manner: A plate, preferably of glass, is carefully coated with a solution of gelatine containing bichromate of potash. It is then dried, and an ordinary photographic negative is placed in contact with it and exposed to the action of light, which hardens all the parts corresponding with the transparent parts of the negative or the dark parts of the picture. After the proper exposure, the plate is washed in cold water to remove all the sensitizing material, and it is then dried. The gelatine surface will be found to have changed, so that it will act precisely like a lithographic stone; when moistened, the parts that were protected from light by the opaque parts of the negative absorb water, while other parts remain dry. A roller charged with fatty ink is rolled over the plate, the ink adhering to the dry parts and being rejected by the parts that have absorbed water. Paper is now placed on the inked surface and subjected to pressure, when the design will be transferred to the piece of paper. Then the moistening, inking, and pressure are repeated until the required number of copies has been produced.

THE PHOTOGRAVURE PROCESS

takes a plate, and covers it with a solution of bichromated gelatine containing a fine powder to give it a grain. This is exposed to light through a negative, just as is done in making artotypes. Then it is washed in hot water, which dissolves all the gelatine that was not affected by the light, carrying with it the fine powder, and which leaves the gelatine with the grain in all the dark parts of the picture. The plate is now dried and placed in an electro-plating bath, or an impression in wax is made from the gelatine plate and then placed in an electro-plating bath. Copper is deposited until sufficiently thick, when the plate is removed and put into the hands of an engraver, who repairs all the imperfections and makes any other desired changes with the burin. Impressions are taken from the plate in the same manner as any copper or steel plate engraving is done. The cost of printing photogravures is very nearly the same as that of printing artotypes, but the photogravure plate costs much more than the artotype plate, and unless the edition required is very large, the plate alone will cost more than the complete edition in artotype.

BRAUN'S REPRODUCTIONS.

Paper is covered with gelatine containing India ink, lampblack, or any other desired pigment, until the whole surface is thickly coated, when it is dried. In making a picture, this prepared paper is immersed in a solution of bichromate of potash for a few minutes and then dried in the dark, after which it is exposed to light in contact with a negative. When sufficient insolation has taken place, the paper is moistened and pressed face downward upon a prepared glass plate. After a pressure of several minutes the glass and paper are put in hot water, dissolving the gelatine, and loosening the paper, that the latter may be stripped off, leaving the gelatine on the glass. The gelatine continues to dissolve, until only so much of it is left as has been sufficiently hardened by light to resist the solution by the hot water, when washed away, until only enough is left to form the picture; the picture after drying is transferred to paper, then finally mounted on cardboard.

THE WOODBURYTYPE

is made by insolating a sensitive gelatine film attached to glass, washing the unchanged gelatine away, and leaving only the parts that form the picture. This, after being dried, is pressed mechanically into a plate of soft metal, making an intaglio, into which is cast a mixture of hot gelatine and any coloring matter. Paper is pressed with a flat pressure and allowed to cool, when the pigmented gelatine will be firmly attached to the paper, which is dried, trimmed, and mounted. The Woodburytypeis adapted only for pictures of comparatively small dimensions. Braun's pictures and the Woodburytypes have to be mounted; this is found to be of great disadvantage in using them for book illustrations. Both are merely thin films of gelatine, and they cannot compare in permanency with artotypes, photogravures, and heliogravures.

### The Effect of Tree Planting in Kansas.

In his Arbor Day proclamation, the Governor of Kansas said that the State, which the pioneers found treeless and a desert, now bears upon its fertile bosom "more than 20,000,000 fruit trees and more than 200,000 acres of forest trees, all planted by our own people." The Governor also says: "That there has been an increase in the rainfall in Kansas is fully proved by the statistics of our oldest meteorologists."

### A Hint for Amateur Photographers.

This is the season for showers, rainbows, and thunder storms. We suggest that a photograph of a first-class rainbow might be an interesting subject for experiment with the camera. Also a night exposure of a plate when the lightning is vivid. Photos of lightning strokes have been made; but we call to mind none of the rainbow.

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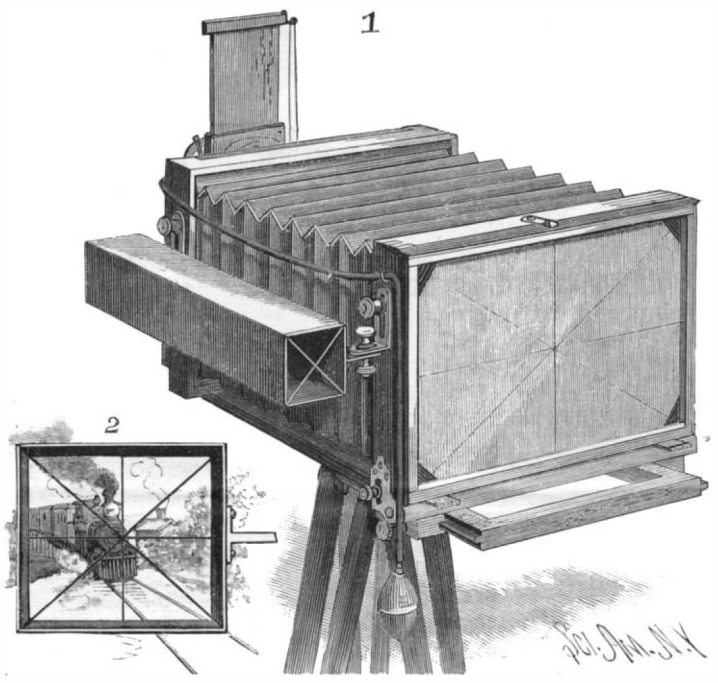
**PHOTOGRAPHIC CAMERA FOR INSTANTANEOUS VIEWS.**

The purpose of this camera is to place the object to be taken with unerring certainty in the center of the sensitive plate, and by it the operator is enabled to take pictures with increased facility while holding the camera in the hand, or even while walking. With a camera so fitted and provided with a drop shutter, pictures of moving animals and groups of people may be readily taken, the pictures being free from stiffness and true to life. The drop shutter of the instrument may have the usual spring handle, but instead of being released by a touch of the finger, which necessitates reaching the hand in front as far as the lens, it may be released by a pneumatic attachment connected by a rubber tube to a rubber bulb at the back of the instrument (as shown) within convenient reach of one hand. Pressure on the bulb instantly operates a piston which releases the shutter. The drop shutter may also be so constructed as to be operated by a slight pull on a string extending to the rear of the camera.

The attachment forming the main subject of this invention, which has been recently patented by Mr. Henry Correja, of 25 Avenue de Villiers, Paris, France, consists of a tube having, preferably, a square transverse section, and having such length, proportioned to the camera on one side of which it is arranged, as to protrude at both its ends through holes in the black cloth usually used on the camera. The forward end of the tube, near the lens of the camera, has cross hairs arranged a little distance within it. One of the cross hairs, which are narrow strips of metal or other material, is placed in a vertical and the other in a horizontal position, so that they divide the "field" in the tube into four equal parts. The back end of the tube is also divided into four equal parts by cross hairs arranged diagonally in relation to the tube. The inventor terms this tube the "finder." To one of its sides are secured two slotted bars arranged at suitable distance apart according to the size of the camera, while in grooves opposite them and connected with the camera are two other bars having corresponding slots; these bars slide up and down, and are secured by binding screws. Marked upon the ground glass of the camera are lines corresponding in arrangement with the cross hairs in the tube.

Before proceeding to take an instantaneous photograph, the object is focused on the ground glass in the camera in the usual way. The operator then looks through the finder and moves it sidewise at either end, or up and down, by means of the slotted bars until the cross hairs occupy the same relation to the object focused as the pencil marks on the ground glass did. The tube is then locked in position by means of the binding screws, and the instrument is ready for use. After the object to be photographed has been properly placed in the field of the tube by the aid of the cross hairs, the operator releases the shutter with one hand while he carries the camera by its shut legs with the other hand. That the object will be properly placed on the sensitive plate with absolute certainty is evident from the fact that after the finder has been adjusted, the object will occupy the same relative position on the plate that it had in the field of the finder.




PHOTOGRAPHIC CAMERA FOR INSTANTANEOUS VIEWS.

**HOFFMANN'S NEW PLAN FOR A CEMETERY.**

The question of cemeteries is one of very great importance, especially in large cities, and an unlimited number of moral, religious, sanitary, social, physical, and financial points must be considered. Cremation solves the problem, but prejudices prevent its early adoption.

A well known artist, Joseph Hoffmann, has designed a new cemetery, which is, no doubt, original. Its practical execution is very doubtful, but, nevertheless, the plan is of sufficient interest to be worthy of notice. Mr. Hoffmann does not intend to bury the corpses, but to place them in a gigantic mausoleum of sufficient size to receive many hundred thousand bodies. Each body is to be placed in a separate compartment, which is hermetically closed. The cells or compartments are each to be about 7 feet long, 3 feet wide, and 3 feet high, and are lined on the inside with glazed tiles, so that no infectious liquids, etc., can be absorbed by the masonry. The general shape of the mausoleum is that of a pyramid surrounded by smaller pyramids, pavilions, arcades, etc.

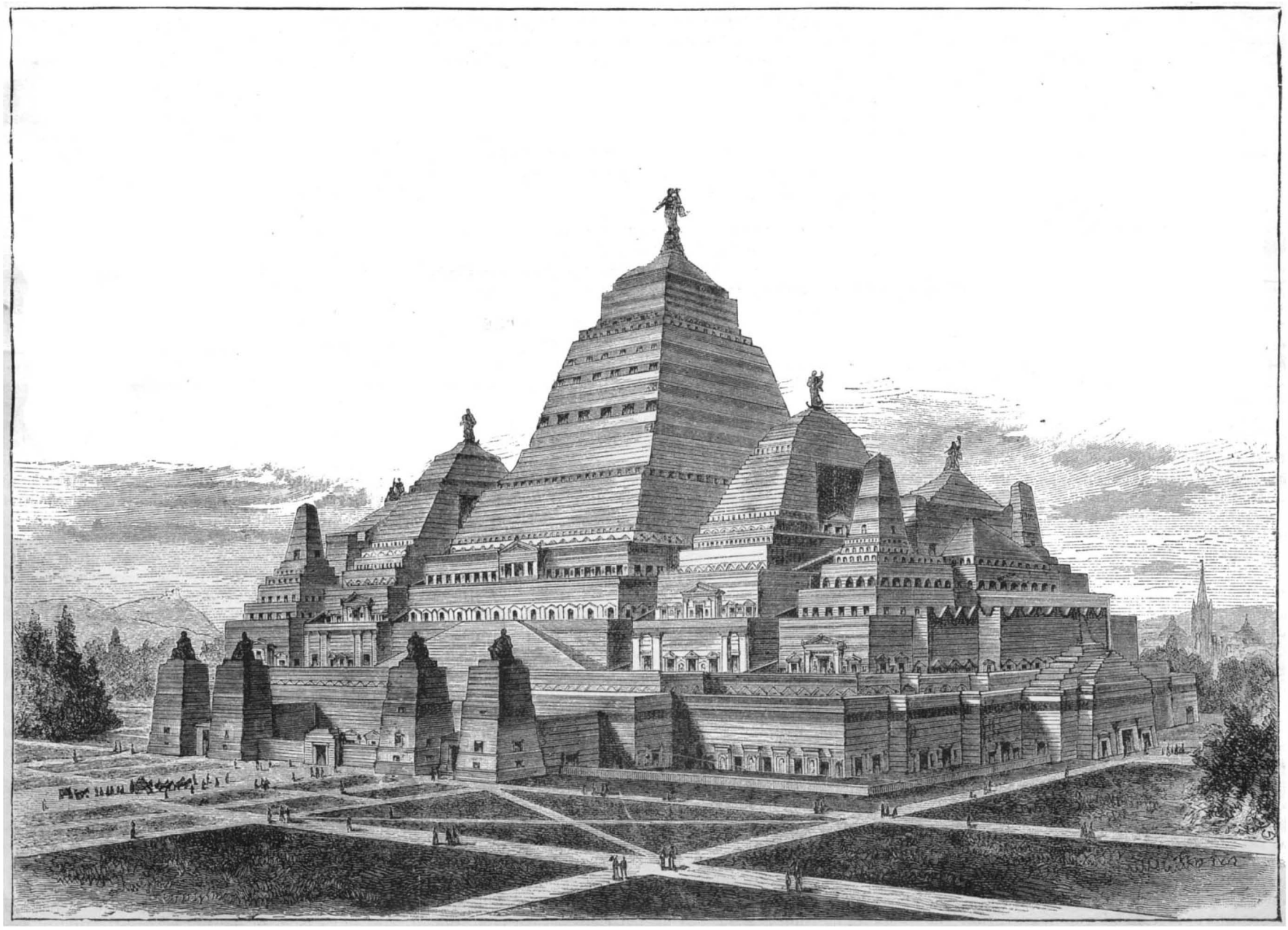
In the annexed cut, taken from the *Illustrirte Zeitung*, one of Mr. Hoffmann's designs is shown. This represents a structure of enormous magnitude, and as the entire building, from the foundation to the top, is honeycombed, or built with cavities, it is evident that a large number of bodies can be entombed therein. The cells are to be so cheap that even the poorest can have his own cell, and his bones need not be disturbed after a certain number of years, as is customary now in our cemeteries.

**Phosphoric Acid from Slag.**

Herr Blum, at Alzette, in Luxemburg, has a process for utilizing the phosphoric acid from the basic Bessemer process. Instead of adding lime to the iron during the blow, he adds carbonate of soda free from sulphur. This is introduced into the converter in a melted state, in the proportion of 5·13 parts to every one part of phosphorus, and 7·85 parts to every one part of silicon; then the pig iron is run in and blown as usual, when the slag is tipped out into an iron wagon. This slag contains phosphate and silicate of soda, and according to the nature of the lining it also contains more or less iron, manganese, lime, magnesia, and sulphur.

It may be used at once direct as a manure; or it may be treated first with cold water to extract phosphate of soda, which has a market for many purposes, after which silicate of soda may be extracted by hot water and used for making water glass, and the metallic residue may be used for making ferromanganese.

A pamphlet by the inventor undertakes to show that the process can be worked at a profit. At Creusot, in order to save carbonate of soda in working extra



DESIGN FOR A CEMETERY, BY HOFFMANN, VIENNA.

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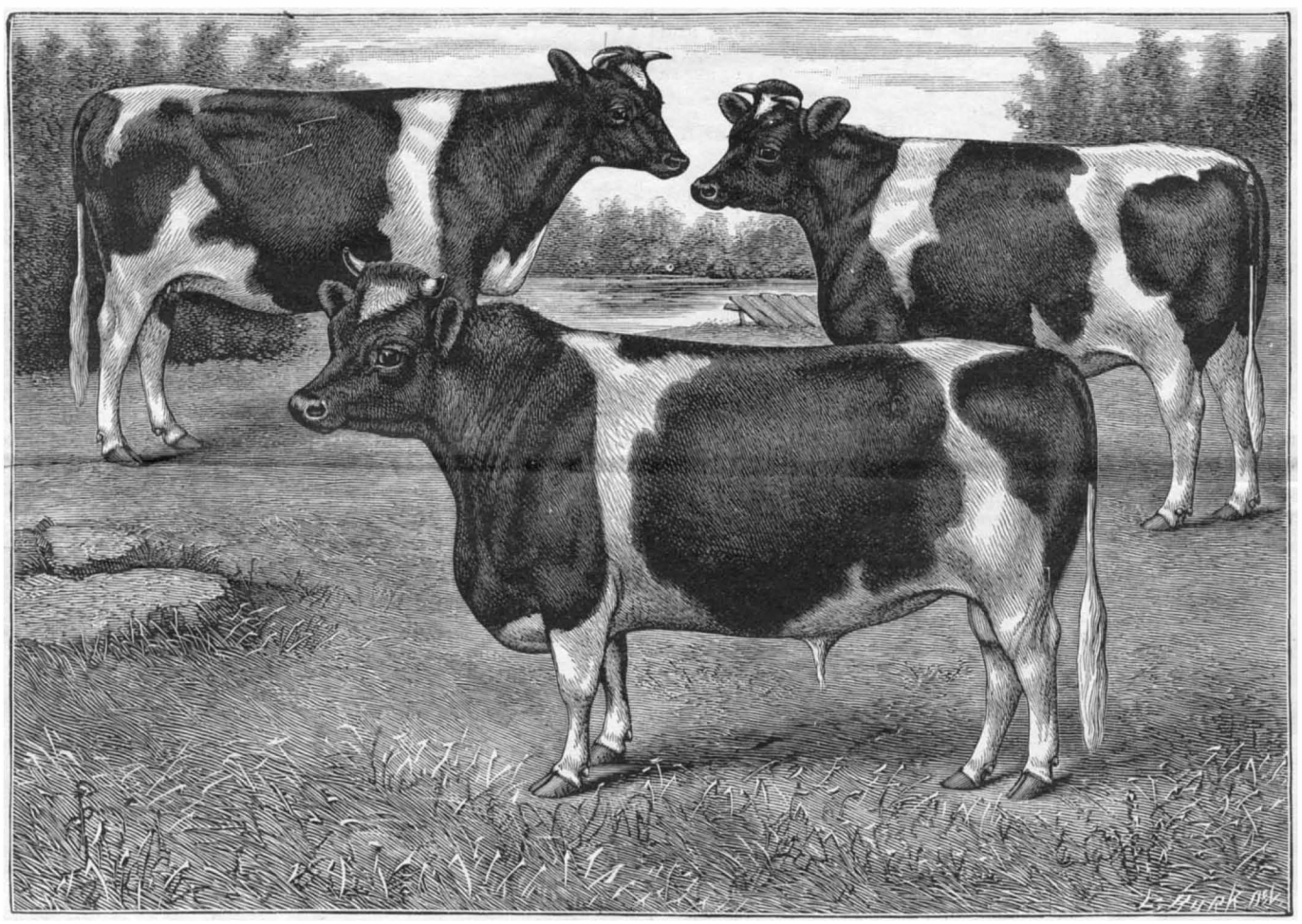
silicious pig iron, lime is first added to combine with the silica formed, and thus slag is removed, after which carbonate of soda is added and a second period of the blow takes place, the phosphoric acid combining with the soda as above. It is stated that vanadium to the value of several millions of francs is lost every year in the slags at Creusot, and that this could be separated from the first extract of the soda slags by cold water.

## THOROUGHBRED CATTLE.

During the decade ending 1880, the number of milch cows on farms in the United States increased 39 per cent, and then reached twelve and a half millions. A large portion of these cattle, except in a portion of the South and of the far West, had been greatly improved by the intermixture of thoroughbred blood from the choicest cattle of Europe, such as the Jersey, Alderney, Hereford, and more recently the Holstein, which are said to combine the excellences of both the Shorthorns and the Ayrshires. The importance of giving close attention to careful breeding has long been widely appreciated among intelligent farmers, in order to the development of sound constitution and symmetrical form, aptitude to fatten, quiet temper, and large milk yielding power; and the group of cattle herewith shown forms a picture which might well delight the eyes of any farmer or dairyman.

They are owned by Messrs. Buchanan Bros., of Chicago, who give us the following descriptions and explanations for publication. The young bull "Duke," of Niagara, 2030 H. H. B., was calved July 2, 1883, sire "Captain" (546), dam "Buda" (1140). "Captain" is a son of the famous cow "Echo" (121), and "Buda" was from "Morning Glory" by "Mahomet." He is a fine, thrifty fellow, and bids fair to make one of the handsomest Holstein bulls in America. The heifers are both imported yearlings of good size and form. "Zee" (5738 H. H. B.) on the right, is a remarkably handsome animal. Her dam has a milk record of fifty-eight pounds of milk a day, as a five year old. Both her sire and dam are registered in the Netherland Herd Book. "Duskje" (5993 H. H. B.), on the left, is very fine in form. Her dam also has a fifty-eight pound record. The entire herd now contains about sixty head of pure bred Holsteins, of which the above are said to be but fair samples.



A GROUP OF HOLSTEIN CATTLE.

## Transformations of Paper.

The uses of paper, outside of its ordinary commercial purposes for printing, writing, and wrapping, are constantly increasing; its great cheapness suggesting its employment for widely differing purposes. Some of its latest uses, in view of its properties, as generally known, seem very curious, but are not more so than its employment as car wheels, in which it has been very successful. It is in fact one of the most adaptable products of the hand of man. One of the most remarkable uses is the manufacture of zylonite, which can be made in imitation of horn, rubber, tortoise shell, amber, and glass. Zylonite may be adapted to a wide variety of uses, but one of its most valuable is an imitation glass for cathedral windows.

The zylonite is much less brittle than either horn or ivory, and much more flexible. As imitation tortoise shell it can hardly be distinguished from the genuine article. In the manufacture of zylonite, plain white tissue paper, made from cotton or cotton and linen rags, is taken and first treated to a bath of sulphuric and other acids, in which it undergoes a chemical change. The next process is the washing of the paper to remove the acids, and it is then treated to another preparation of alcohol and camphor. Its appearance by this time is very much like parchment, and it can be worked up into plates of any thickness, and made perfectly transparent, or can be dyed all the brilliant colors that can be given to silk.

### SHEETS AND SHAMS.

A widely different use from the above is in the manufacture of counterpanes and pillow shams. These articles are composed of two sheets of No. 1 Manila paper. To hold the sheets together, and to strengthen the fabric, small gummed twine is used at distances of three or four inches. The sheets are also hemmed about the edges so as to prevent tearing. Handsome designs may be and generally are printed upon the upper surfaces of the shams and counterpanes. The articles are very neat, serviceable, and cheap. All wrinkles can be removed by hot flatirons. As the paper will prevent the escape of heat about as well as a woolen blanket, it can be made a very serviceable article of bed clothing, as it can be left upon the bed if desired.

Though paper pulp is not strictly paper, a glance at some of its uses is properly within the scope of this article. A recent use for which a patent has been granted is in the manufacture of sheathing and roofing papers. The sheathing paper is made from a pulp of spent tan bark, meadow hay, and mill waste as a center, with a layer of pulp on either side, composed of cotton or linen rags, waste papers, or a mixture of similar materials. The roofing paper has the same middle, but the covering is a pulp composed of satinet and colored rags, shoddy, and straw. Both of these articles are said to be excellent for the purpose intended.

### PAPER PULP FABRIC.

Perhaps the most important of the recent inventions or applications of paper pulp is in the manufacture of paper pulp fabric. This material is designed for articles which require the characteristics of paper and, at the same time, much more strength than paper alone possesses. Paper pulp fabric in the past has been made by securing sheets of finished paper to sheet metal by means of a cement or an adhesive of some kind. This fabric was necessarily somewhat limited in area, as the area of the metal sheets were limited.

The latest paper pulp material is made in continuous webs or lengths in all desired widths. The fabric is composed of a wire cloth, of a desired fineness or coarseness, covered with paper pulp. It thus possesses all the strength of metal and all the flexibility, softness, and smoothness of paper. The continuous webs of paper pulp are combined with the continuous web of wire cloth, so that the pulp is forced through the meshes of the wire cloth, completely filling them and at the same time completely covering the wire.

### METHODS OF MANUFACTURE.

The pulp is manufactured by an ordinary paper making machine, so as to deliver two independent and continuous sheets of paper pulp at certain points, from which the webs or continuous sheets are fed into suitable pressure rollers. A roll of wire cloth is placed in the line of feed near the pressure rollers and is fed into them at the same time, and between the two continuous sheets of paper pulp. The rollers press the three webs together, and in the operation the two webs of paper pulp fill the meshes of the wire cloth as well as completely enveloping it.

The fabric is afterward dried, and is then ready for use. Before being passed through the rolls and covered with the pulp, the wire cloth is waterproofed or not as desired.

The fabric looks exactly like paper of the same texture and quality. The surface of the fabric may be finished by painting, varnishing, etc., or by treating it with a fireproofing or waterproofing compound, or by covering it with finished paper, etc. As the fabric is a continuous sheet, pieces of the sheets can be easily cut into the proper shape for any use or for any article, especially those that can be formed without seam. The parts can be easily seamed together, however, if necessary, by paste or cement as in ordinary paper, and the joints may be united as perfectly as paper, as all the joints on the outer surface are of pulp.—*Com. Bulletin.*

## A Rare Visitor.

The seventeen-year locust is making its appearance in great numbers in various parts of the country, though very few have been seen in Philadelphia as yet, says the *Inquirer*. For a long time after this insect had received its popular name, scientists were inclined to laugh at the theory that its visits were repeated at seventeen year intervals, but further study showed the accuracy of the unscientific observers. The harvest fly, as it is properly called—for it is not a locust at all—appears irregularly in different sections, but only once in seventeen years in the same section, and this because seventeen years are required to develop the perfect insect from the egg. There is another kind which completes its period of development in thirteen years, but it is comparatively rare. The "locust" is not injurious, except to the small twigs of trees. It eats nothing while in its winged state, but the female punctures the twigs of various kinds of trees and lays her eggs in the wound, after which the twig usually dies, thus disfiguring and possibly injuring the tree; though in most instances the pruning thus effected is beneficial rather than the reverse. In about six weeks the eggs hatch out, and the young insects, in their grub or larval state, drop to the earth, into which they immediately burrow until they find a root. They attach themselves to this, and there remain for seventeen years, living on the sap of the root, which they suck up through a tube something like that of the mosquito. When the appointed time arrives, they burrow upward again, and crawl up some tree or wall to the height of a few feet from the earth, where they shed their chrysalis coats and become perfect insects; after which their life is a short and merry one. They sing by night and fly about by day, but perish in a week or two, having run their natural course.

## Designs for Carpets.

In the School of Designs, in South Kensington, there are several quotations which are regarded as axiomatic, and they unequivocally direct the efforts of the pupils. The following is the rule upon carpet design:

1. The surface of a carpet, serving as a ground to support all objects, should be quiet and negative, without strong contrast of either forms or colors.

2. The leading forms should be so disposed as to distribute the pattern over the whole floor, not pronounced either in the direction of breadth or length, all "up and down" treatments being erroneous.

3. The decorative forms should be flat, without shadow or relief, whether derived from ornament or direct from flowers or foliage.

4. In color the general ground should be negative, low in tone, and inclining to the tertiary hues.

IN packing bottles in cases for transportation, India rubber bands slipped over the bottles will prevent breakage, and save considerable in packing material.

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## ENGINEERING INVENTIONS.

A locomotive ash pan has been patented by Mr. William W. Slocum, Jr., of Reed City, Mich. Combined with the ash pan is a compartment formed on the front end and in front of the front part of the fire box, with a damper valve in the top of this compartment, the ash pan being such as can be dumped at the will of the fireman.

A car coupling has been patented by Mr. Thomas B Nutting, Sr., of Morristown, N. J. It is made with drawheads having hooks with shoulders on their rear ends, and hinged to the drawheads by bolts, the hinging bolts having cranks and a bail and chain, so the cars will be coupled automatically when run together, and can be readily uncoupled.

An electric locomotive has been patented by Mr. Joseph Weis, of Jersey City, N. J. The frame carries a boiler and an ordinary steam engine with a large drive wheel, connected by belt with the armature shaft of a dynamo electric machine, which gives motion to an electric motor connected with the drive wheels, the construction and arrangement of parts being of a novel character.

A steam valve has been patented by Mr. William Mitchell, of Altoona, Pa. This invention covers a vibrating cylinder valve of novel construction, the valve being of equal diameter throughout, and adapted to be rocked to cause its passages to coincide alternately with the ports of the casing, the steam pressure being so equalized in the valve that it works with but little friction.

A car truck has been patented by Mr. Charles L. Morehouse, of Brooklyn, N. Y. Short axles are journaled in the side bars, flanged wheels are on the axles, and shafts journaled on the side bars above and at each side of each axle, the object being to provide an anti-friction railway truck so made as to turn curves with great facility and without the slipping of the wheels.

A car coupling has been patented by Mr. Roscoe A. Merrow, of Farmington, Me. The opposite drawheads of the same car are arranged to slide endwise and against buffer springs, and connected by a drawbar, so the coupling bar, drawheads, and cars will be relieved by breaking shocks or strains in coupling or while on the road, there being also a frame and levers by which the cars may be uncoupled from the top or either side.

A steam engine has been patented by Mr. Larkin B. Ellis, of Vernon, Mich. Clamps or pawls, and an endless belt or chain, are used in lieu of the crank for transmitting motion, the clamps being contrived to take hold of and let go the upper and lower ranges of the endless belt according as the motion of the crosshead reverses, to drive the belt or chain continuously in one direction, in order to apply the power with uniform leverage from beginning to the end of the strokes, and avoid the varying leverage of crankgear.

## AGRICULTURAL INVENTIONS.

A hay loader has been patented by Mr. Max F. E. Stadtmueller, of Castle Grove, Iowa. At its upper end are curved guide bars and adjustable guide wings, with hinging rod and adjustable bar and keeper, the guard frame carrying rake teeth and connected with the side boards of an elevator, so both guard frame and rake teeth can be readily adjusted.

A hay raker and loader has been patented by Messrs. J. Huff Corcoran and Ludwig Rummel, of Alden, Iowa. Combined with the rake and elevator is a pivotally secured bar having a series of rods supported on the elevator for weighting the hay in the rake and pressing it against the elevator apron, making an attachment for an ordinary farm wagon, to rake and load hay after a mowing machine.

A cultivator has been patented by Mr. Sumner B. Little, of Chapin, Iowa. Combined with the tongue is a tube, adjustable rod, set screw, etc., whereby the tongue can be readily lengthened or shortened; the plow beam and feeder bars are so arranged that the latter can be easily adjusted, and in connection with the draw rods or chains is a spring to prevent the horses and harness from receiving undue jars should the plow strike an obstruction.

## MISCELLANEOUS INVENTIONS.

A fence has been patented by Mr. William Cokayne, of Geetingsville, Ind. It rests on transverse bed pieces or sills, requiring no post holes, the bases resting on the ground, into which the stakes are inserted, with which rails, oblique board bases, and wire braces are so used as to make a fence of novel construction.

An extension table has been patented by Mr. Albert E. French, of East Tawas, Mich. The table has a stationary middle part, with a central leg, and extensible end parts, with legs, pockets, and folding hinges, and other novel features, the invention relating to extension tables with folding web sections for forming the top of the table.

A folding coat hanger has been patented by Mr. George H. Donaldson, of Westville Center, N. Y. It has hinged and sliding sections and an adjustable block, so arranged that the whole may be folded to occupy small space in a traveling bag or trunk, and adjusted both in length and slope to fit and keep in shape coats of different sizes and cut.

A metallic roofing shingle has been patented by Mr. Levi H. Montross, of Simcoe, Ont., Canada. This invention covers a special construction allowing for expansion and contraction without making loose joints, while the shingles thoroughly interlock, thereby being held very securely on the roof and forming very close and tight joints.

A fence making machine has been patented by Mr. Luke Huiskamp, of Keokuk, Iowa. This invention relates to that class of machines used to assist the operator in making by hand fences of wire and slats, providing picket spacing, twisting, and tension devices, whereby the various parts of the work are simplified and made easy.

A needle has been patented by Mr. Thomas C. Adams, of Brooklyn, N. Y. It has a transverse slot formed in at one side of the eye, so it may be threaded through this slot by taking the thread between the thumb and finger and drawing it taut, the eye being made to one side, so the metal will have sufficient strength after the slot is formed for all ordinary use.

An automatic fire lighter has been patented by Mr. Charles Hughes, of New York city. Combined with an alarm clock mechanism is a spring-actuated lever adapted to hold a match and a piece of inflammable material, a trigger for locking the lever, and a rod carrying a plate with a piece of sand paper, whereby a fire may be lighted at any desired time for which the watch is set.

A fire escape has been patented by Mr. John Dittrick, of Smith's Falls, Ont., Canada. The invention covers a drum shaft adapted to be moved endwise, with suitable frame, rope, and operative parts, an upright with pulley, and other novel features, making a device readily applied by which a person can lower himself slowly from a building, and will be held away so as not to come in contact therewith.

A roller skate has been patented by Mr. George A. Thompson, of Frostburg, Md. Two sets of metallic brackets and hangers are attached to the foot stock, one set to the heel and the other to the toe, each set consisting of a stationary and movable part, and there are other novel features of construction, to allow the rollers to work freely, while the bearings are solid and there is great flexibility in the working parts.

A riding saddle has been patented by Myra L. Eckles, of Northfield, Minn. This invention has special reference to side saddles for ladies' use, but is also applicable in part to pack saddles and men's saddles, its object being to furnish a saddle more comfortable to the horse, permitting a freer action, and which shall better adapt itself to the shape of the horse in different positions.

A machine for sacking, weighing, and registering grain has been patented by Mr. George H. Caughrean, of Pleasant Hill, Mo. It is made with an elevator, a hopper, a holder to receive the sack, scale beam, and weight, a cut-off with spring and arm for stopping the outflow, a register, and other specially combined features, for use with thrashing machines, corn shellers, mills, and similar purposes.

The construction of skylights, etc., forms the subject of a patent issued to Mr. Alphonse Friedrick, of Brooklyn, N. Y. This invention covers an improvement on a former patent of the same inventor, for strengthening lead sashes used in especially designed windows, consisting of a manner of construction by which the wire frame attached to the sash bars is further strengthened, and the whole window supported by auxiliary frames or bars at the upper side of the sash.

A radiator is the subject of two patents issued to Mr. John Gormly, of Provo City, Utah Ter. It is made of tubes of sheet metal fitted with caps, and of cast metal connections fitted into a hollow base which has inlet and outlet pipes for passing the heating agent, in such way as to be comparatively inexpensive, give a large radiating surface, and promote quick circulation, thus allowing the heating of apartments with less area of tubes than is required in ordinary radiators.

A detachable horseshoe has been patented by Mr. Emil Hunziker, of Jersey City, N. J. It is a heavily calked shoe with a lug on the inner edge of one shank and a cam lever pivoted on a bracket plate on the opposite shank, the shoe being so placed against the ordinary shoe that the lug rests against the inner edge of one shank of the fixed shoe and the cam lever engages the other shank, thus facilitating the fastening and unfastening of heavy calked temporarily secured shoes.

An axle lubricator has been patented by Mr. Joseph M. Denney, of Wartsburg, Washington Ter. Combined with the hub is a screw threaded tube with a fixed collar or enlargement and screw threaded neck, the internal screw threaded portion of the neck being adapted to receive a plug, and its external screw threaded portion being fitted with a cap, constituting a device which excludes dust and facilitates lubricating by thick grease, waste saturated with oil, or other suitable lubricant filled into the tube.

## NEW BOOKS AND PUBLICATIONS.

NYSTROM'S POCKET BOOK OF MECHANICS AND ENGINEERING. By John W. Nystrom. J. B. Lippincott & Co., Philadelphia. 670 pages. Price $3.50.

This is the eighteenth edition, revised and considerably enlarged, of a work which first appeared in 1854. The new matter in this edition includes valuable tables and formulæ concerning the transmission of power by belting, ropes, gearing, etc.; and the elements of mecanics are, in general, brought down to a simple form.

FORESTS AND FORESTRY OF POLAND, LITHUANIA, ETC. By John Croumbie Brown. Oliver & Boyd, Edinburgh.

This is the twelfth of a series of manuals by Dr. Brown on Forestry and Forest Culture, the effects of forests on climate and water supply, etc., each one of which contains much valuable information, a large portion of it the result of personal observation and experience.

### *Books Received.*

AMERICAN ELECTRICAL DIRECTORY FOR THE ELECTRIC LIGHT AND TELEPHONE INTERESTS OF NORTH AMERICA. By E. J. & W. H. O'Beirne. Star Iron Tower Company, Fort Wayne, Ind.

WATER WORKS STATISTICS OF GREAT BRITAIN, 1885. By Charles W. Hastings. Scientific Publishing Company, London, Eng.

GAS WORKS STATISTICS OF GREAT BRITAIN, 1885. By Charles W. Hastings. Scientific Publishing Company, London, Eng.

GAS AND WATER COMPANIES DIRECTORY OF GREAT BRITAIN, 1885. By Charles W. Hastings. Scientific Publishing Company, London, Eng.

NEW YORK STATE DAIRY COMMISSIONER'S FIRST ANNUAL REPORT, 1885. Weed, Parsons & Co., Albany N. Y.

## Business and Personal.

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Several large Paper Mills have adopted Volney W. Mason & Co.'s Friction Pulleys for driving their machines. Providence, R. I.

Wood Working Machinery. Full line. Williamsport Machine Co., "Limited," 110 W. 3d St., Williamsport, Pa.

Hull Vapor Cook Stoves.—Best in the world; sell everywhere. Agents wanted. Send for catalogue and terms. Hull Vapor Stove Co., Cleveland, Ohio.

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Catalogue of Books, 128 pages, for Engineers and Electricians, sent free. E. & F. N. Spon, 35 Murray Street, N. Y.

*Knots, Ties, and Splices.* By J. T. Burgess. A Handbook for Seafarers and all who use Cordage. 12mo., cloth, illustrated. London, 1884. Sent, postage prepaid, on receipt of 50 cts., by Munn & Co., New York.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 398.

Anti-Friction Bearings for Shafting, Cars, Wagons, etc. Price list free. John G. Avery, Spencer, Mass.

Pat. Geared Scroll Chucks, with 3 pinions, are sold at same prices as common chucks by A. F. Cushman, Hartford, Conn.

Cyclone Steam Flue Cleaners are the best. Crescent Mfg. Co., Cleveland, O.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Hoisting Engines. D. Frisbie & Co., Philadelphia, Pa.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 414.

Catechism of the Locomotive, 625 pages, 250 engravings. Most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for catalogue of railroad books. The Railroad Gazette, 75 B'way, N. Y.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 348.

Stephens' Patent Bench Vises are the best. See adv., p. 348.

"*To Mechanics.*"—When needing Twist Drills, ask for "*Standard*," or send for catalogue to Standard Tool Co., Cleveland, O. See page xv., Export Edition.

The best Steam Pumps for Boiler Feeding. Valley Machine Works, Easthampton, Mass.

## Notes & Queries

### HINTS TO CORRESPONDENTS.

**Names and Address** must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
**References** to former articles or answers should give date of paper and page or number of question.
**Inquiries** not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
**Special Information** requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.
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**Minerals** sent for examination should be distinctly marked or labeled.

(1) H. N. S. writes: A. claims that a rope passed over a horizontal bar, with one end fast to the floor, and suspended from the other end a weight of ten pounds, will produce the same weight or pressure on the bar as though from each end of the rope was suspended 10 pounds. Is he right, or what would the weight be upon the bar with one end fast and from the other the 10 pounds suspended? A. 20 pounds. A. is right.

(2) H. G. W. writes: 1. I have two cells of Bunsen battery in which I use 4 parts of bichromate potash solution to 1 part sulphurous acid in porous cup, and 1 part sulphuric acid to 8 of water in jar with zinc. I do not get as much current as I want to. How can I increase it? A. You can increase the current only by adding more cells. 2. Would it be better to make two Grenet cells? A. It depends altogether on the use to which you intend to apply the battery; if you want a battery for temporary use on a circuit of small resistance, we think the Grenet form will be best. 3. Can I melt brass in a Hessian crucible over an open coal fire? A. Yes; place a little borax in the crucible for a flux, and close the mouth of the crucible with a large piece of charcoal. 4. Where can I find directions for making moulds and casting in brass? A. We can furnish you works on moulding and casting; you will also find much information in the back numbers of the SCIENTIFIC AMERICAN and SUPPLEMENT. 5. Can I make moulds of plaster Paris? A. Not for brass. 6. Where can I find a description of M. Trouve's chromic acid battery? A. In the back numbers of the SUPPLEMENT.

(3) G. E. W. asks how to build a stone dam 70 feet long by 10 feet high. A. Dam should be 8 feet wide at bottom, 4 feet at top, sloping back; floor may be made of rough logs under the spill, to break the fall of water. Portland cement is the best, 1 barrel to 3 barrels sand; mix as required in small batches for the best results. We think a wooden trunk the best. Make it square or octagon as convenient, 20 inches diameter; build end into the masonry a few feet, well cemented, and terminate in a stone facing on upper side. Make a coping of large stone sloping back on the spill, and flank with abutments of large stone. Fill in behind the dam with gravel and marl even with top of coping, sloping back at least 30 feet, covering the filling with broken stone.

(4) N. D. writes: I have a large, nice refrigerator for family use. We use in it a large cube of ice of 100 pounds, but the temperature will not go below 48° or 47°, and the ice melts rapidly, 200 pounds a week. Ought not the refrigerator to be ventilated as ice houses are? A. You probably have too much ventilation already, possibly the refrigerator is not properly insulated; 200 pounds a week is too much ice for a family refrigerator. Cannot tell what is the matter out of sight.

(5) A. F. G.—There is very little difference in the absorption of power by belts or gearing in a well devised plant.

(6) C. A. S.—The black finish made on parts of brass goods is by a dip in a solution of chloride of platinum, made by dissolving platinum in nitro-hydrochloric acid to saturation. It will bear very little burnishing or polishing. We think it derives its finish by lacquering.

(7) Mrs. R. W. W. asks: What will be the effect on the health or nerves of adults and school children living in the mountains seven hundred feet above the valley, if they every morning go to the valley, returning at night? A. No evil whatever need be apprehended. The change of atmospheric pressure is altogether too slight to produce any appreciable effect on the nervous system of any person in an ordinary state of health.

(8) A. P. McD. asks how to make hard solder, such as is used by manufacturing jewelers, that will flow with the lowest degree of heat; also process for tempering brass. A. Solder for silver to melt at low temperature: Silver 1 part, tin 1 part. Low solder for gold jewelry: 3 parts gold, 2 parts silver, 1½ parts copper, ½ part zinc. Know of no way to temper brass except by hammering, rolling, or burnishing.

(9) J. M. W.—Boiler tubes made within the last 15 years do not last as long as the earlier make. The quality has been gradually decreasing by the competition in trade, so that they may be said to be an alloy of iron and slag. The best plan is to put in steel tubes. We do not know of any harm in burning paper to dry printers' forms; steam is better in the form of a steam slab.

(10) G. C. K. desires information as to how to make a cheap filter. A. The mixture of charcoal and gravel is fully equal to anything that can be used for filtering. If you prefer, the gravel can be substituted by spongy iron (metallic iron). See "Experiments with the Silicated Carbon and Spongy Iron Filters," contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 165.

(11) E. C. T.—The bones sent belong to "Didelphys Virginiana," Virginian opossum.

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(12) J. M. R. desires information how to make a liquid glue equal to Royal glue. A. Take a wide mouthed bottle, and dissolve in it 8 ounces best glue in ½ pint water, by setting it in a vessel of water, and heating until dissolved. Then add slowly 2½ ounces strong aqua fortis (nitric acid), 36° Baume, stirring all the while. Effervescence takes place under generation of nitrous acid. When all the acid has been added, the liquid is allowed to cool. Keep it well corked, and it will be ready for use at any moment.

(13) B. H. C. asks how to make acid phosphate. A. Acid phosphate of calcium ($CaH_4P_2O_8$) is formed by boiling bone earth with sulphuric acid. It is also formed by dissolving the di or tri calcic salt in aqueous phosphoric, nitric, or hydrochloric acid; it then crystallizes on evaporation in small laminæ or scales containing one atom of water.

(14) H.—Hard bronze or gun metal, made of copper 14 ounces, tin 2 ounces, is the strongest and best for both nuts and boxes for lathes. Babbitt and yellow brass are not reliable for wear or accuracy.

(15) L. M. F. asks which, in a pecuniary point of view, would be the better profession—mechanical or civil engineering, supposing a person had a considerable taste for mathematics as well as for mechanics. A. If you are equally well adapted to either profession, we think you should be governed entirely by your opportunities, as there is very little difference between the two in a pecuniary point of view. It is probable that there are more opportunities in civil engineering than in mechanical engineering.

(16) H. R. asks how to make an electric bell, such as is used for burglar alarms, etc. A. You will find in the back numbers of the SCIENTIFIC AMERICAN and SUPPLEMENT ample directions for making an electric bell. The common method is to place in front of a small electro magnet, of 8 or 10 ohms resistance, an armature supported by a flat spring at one end and carrying at the other end a bell hammer. Near the back of the armature is placed a spring carrying a contact screw, capable of touching a platinum point fixed in the back of the armature. The battery current is taken through the magnet to the spring of the armature through the contact screw, and the spring supporting it, back to the battery. When the current is sent through the coils of the magnet, the armature is attracted away from the contact screw, and made to strike the bell; but on leaving the contact screw the current is broken, and the spring of the armature returns the armature to its original position in contact with the screw; the current being again established, the armature is again attracted, and so on.

(17) E. R. M. writes: I have made the telephone described in the SCIENTIFIC AMERICAN SUPPLEMENT, using earth plates, and have set it up on a line of about 500 yards, and it will not work. I attached it to some of the Bell telephones here, and it worked well, but when on a line of its own it doesn't work at all. Could you suggest what might be wrong? I made the diaphragms larger than in the directions, which made it sound clearer than when I had the smaller ones. A. The trouble probably lies in your earth plates; to be of any service they should be buried in earth that is constantly moist, and they should have an area of at least 12 or 15 square feet.

(18) "Willie" writes: 1. The mouth of the Mississippi River is about 2½ miles farther from the center of the earth than its source. In this sense it is said to "run up hill." What causes this apparent opposition to the attraction of gravity? A. Nothing runs "up hill" that is subject to gravity for its moving force. The form of the earth is the resultant of the two forces derived from gravity and centrifugal motion. The sea (tides and waves excepted) represents its true form as a fluid body. The land (with a few exceptions) is above the sea level, and all water running toward and into the sea runs down hill. 2. Which is better for a small cannon—iron or brass? A. Good tough brass is the best for a small cannon.

(19) C. O. T.—Babbitt metal consists of 3·7 copper, 89· tin, 7·3 antimony, by weight. For hard boxes, 90 copper, 10 tin. You may also harden Babbitt metal by using less tin, for any requirement. Phosphor bronze with 10 per cent of tin is also used. Copper 60, zinc 44, iron 4, tin 2, also makes a good anti-friction bearing for hydraulic presses.

(20) A. H. D.—The running of a shaft 4 inches diameter 120 feet long is perfectly feasible and economical. The condensation in a steam pipe well laid and felted will not be great, but we presume that you will have to run another engine with the steam, which will not be economical, in lieu of the shaft.

(21) S. & F.—Steel stamps are cut with gravers, files, punches, and small chisels. It is the art of the engraver and die sinker. Steel stamp cutters make their own small tools. A bench vise, a hand vise, small hammer, gravers, and files you may obtain through your hardware dealers. A blacksmith can make the small chisels and punches.

(22) G. H. A. asks: 1. Will you please inform me why resin cannot be used instead of acid for tinning metals? A. It can, but is not as efficient. 2. What action has muriatic acid on metals? A. It dissolves the oxides on the surface, leaving a clean metallic surface. 3. What is the object of putting zinc in muriatic acid for tinning purposes? A. The zinc in the tinning acid is precipitated upon the metallic surface by galvanic action, thereby facilitating the metallic contact of the tin. 4. How much zinc is put in the acid for tinning? A. As much as the acid will take up. 5. Why is it that solder will not float nice without resin when you are using the soldering iron? A. Because the resin forms a flux that absorbs the oxide and makes a clean contact of the metals.

(23) C. B. G. desires a glue that will make woolen cloth stick firmly to iron rolls. A. Fuse together equal parts of gutta percha and pitch. Use hot. See other recipes given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(24) J. C.—Varnish may be removed by warming and applying methylated spirits or wash, with equal parts of turpentine and spirits of ammonia, then wash with soap suds.

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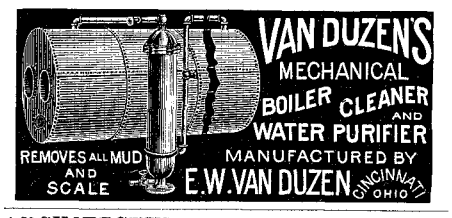


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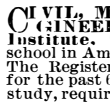


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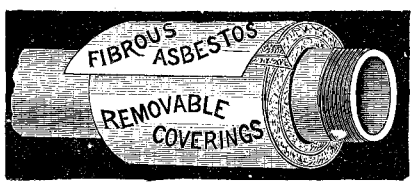


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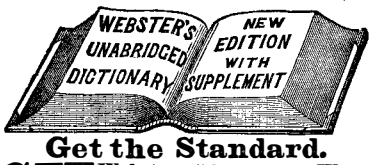


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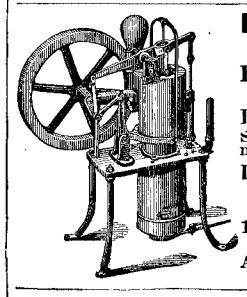

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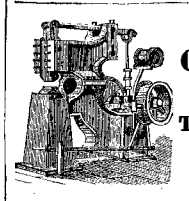

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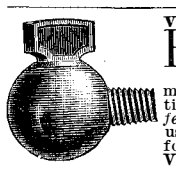

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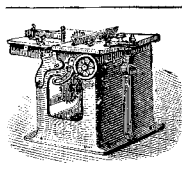

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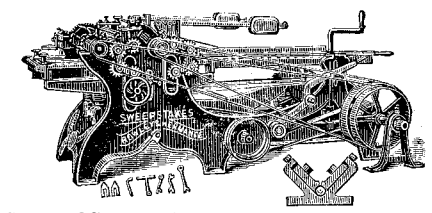

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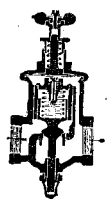

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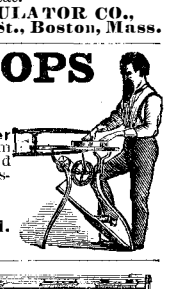

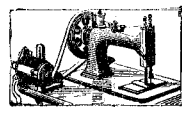



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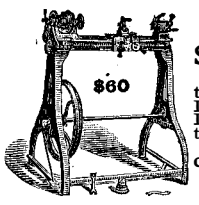


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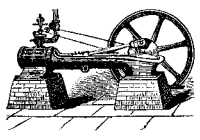

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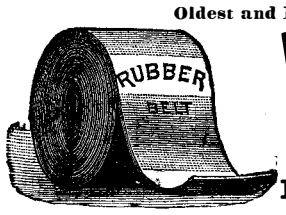


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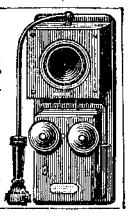

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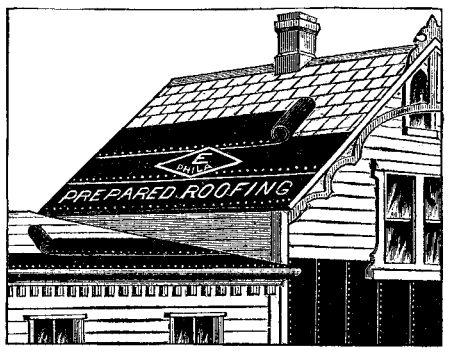


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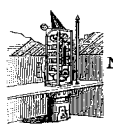

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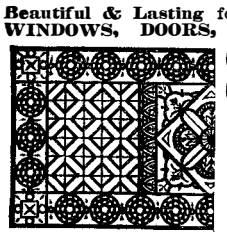

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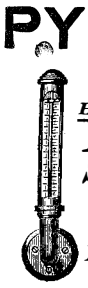

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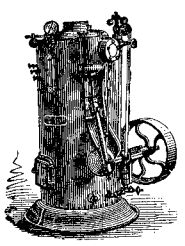

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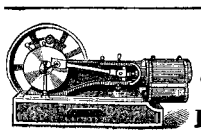

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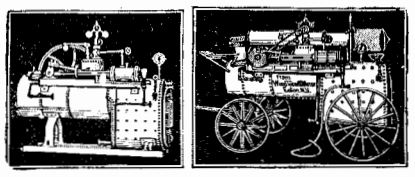

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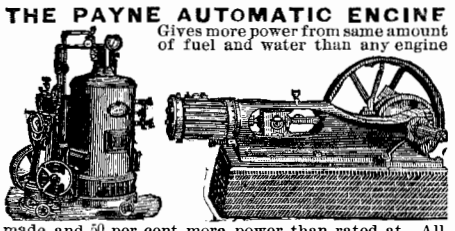

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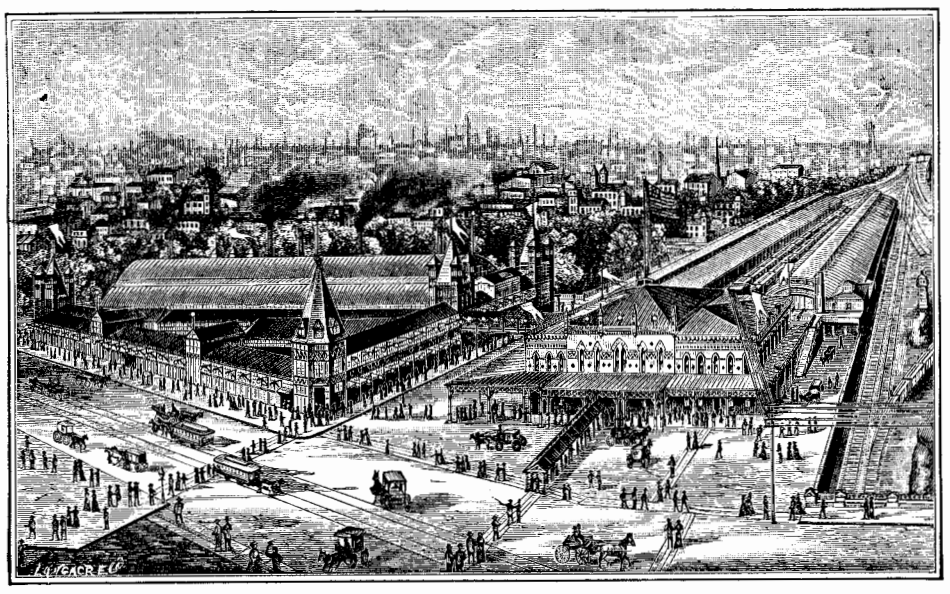

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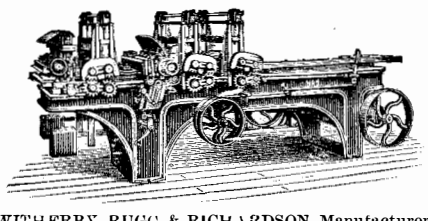

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